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VOL. XI.

Including Numbers LI-LV.

1918-1919.

With Plates CL-CLXIV.

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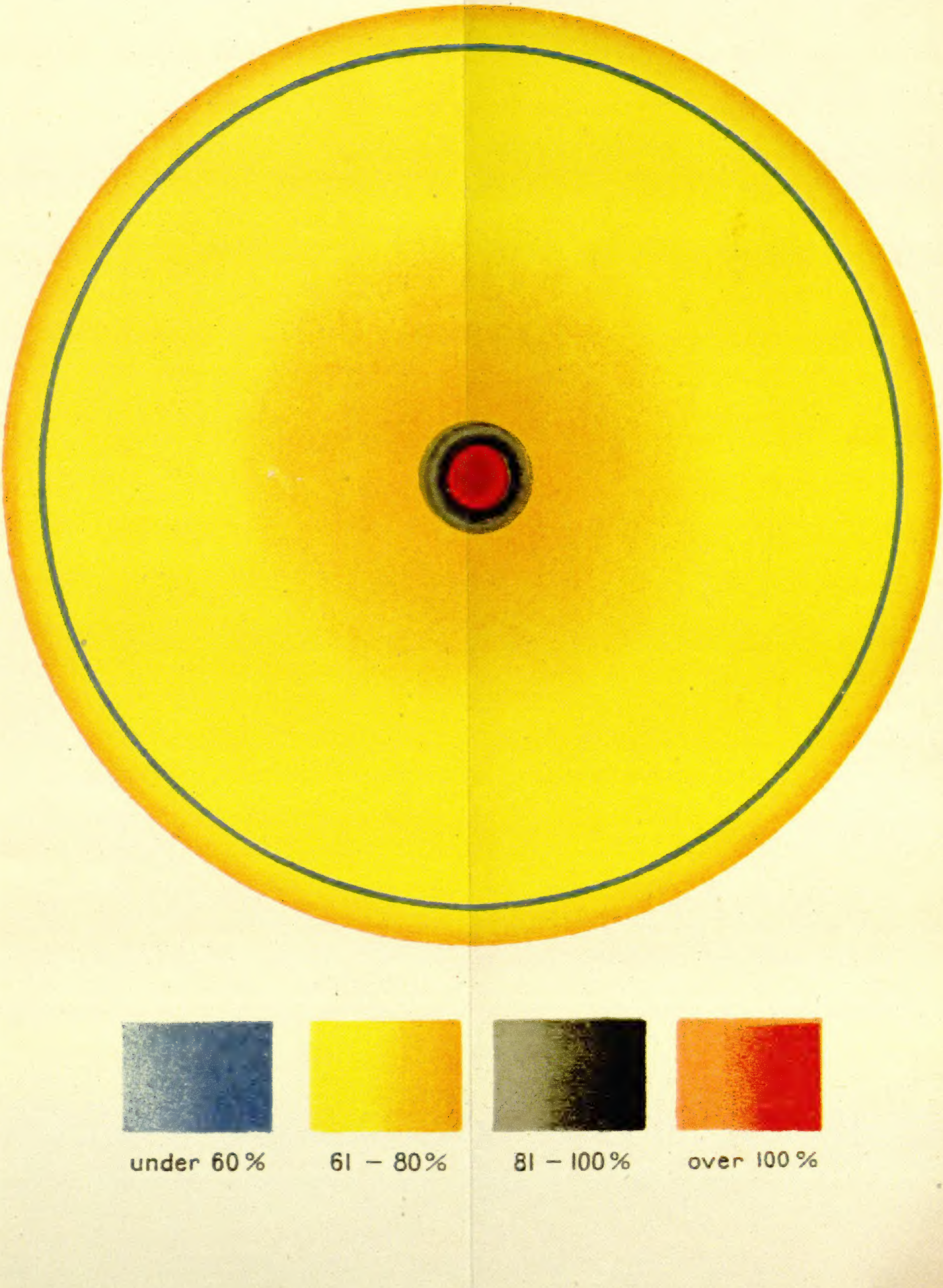

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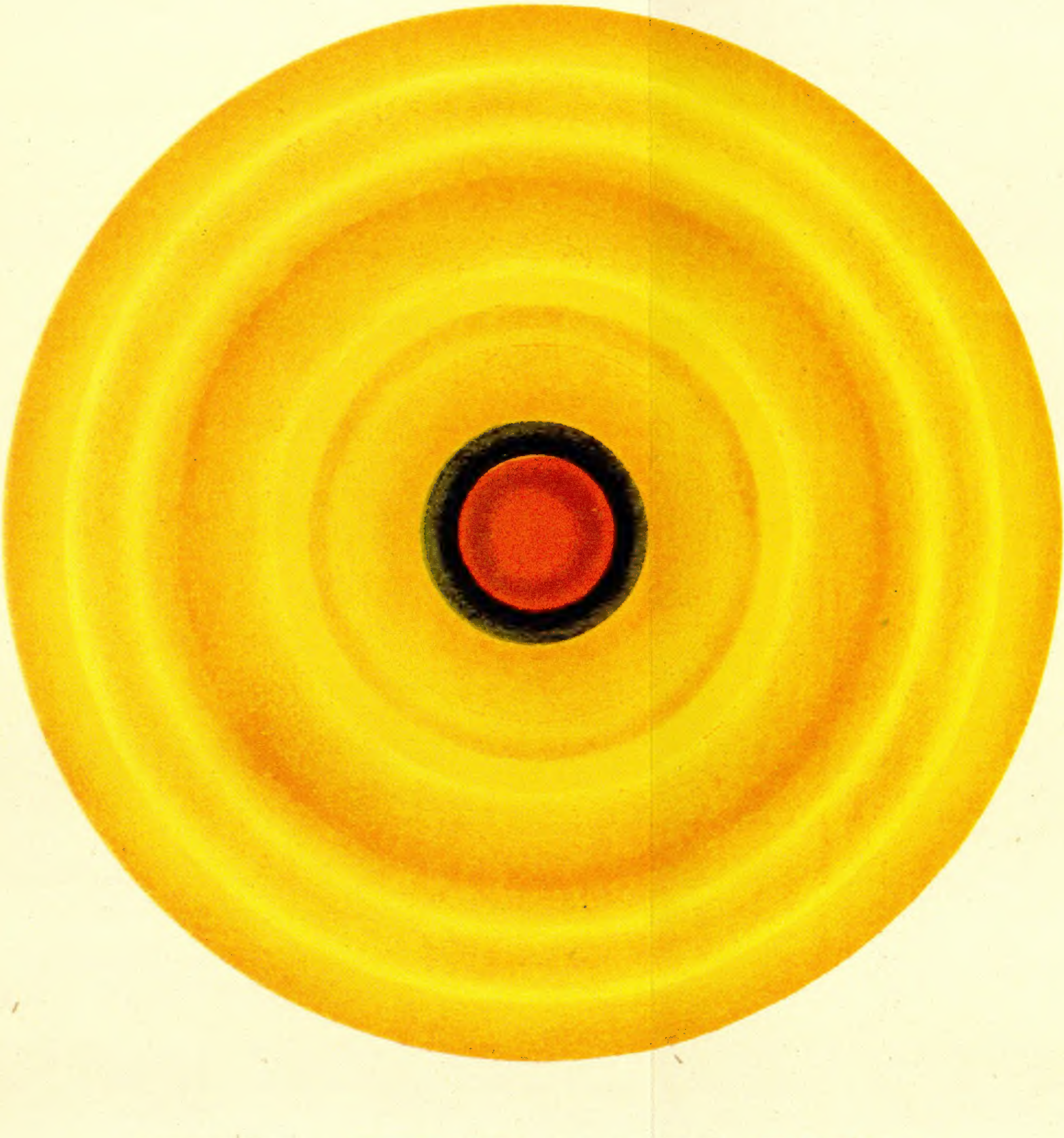

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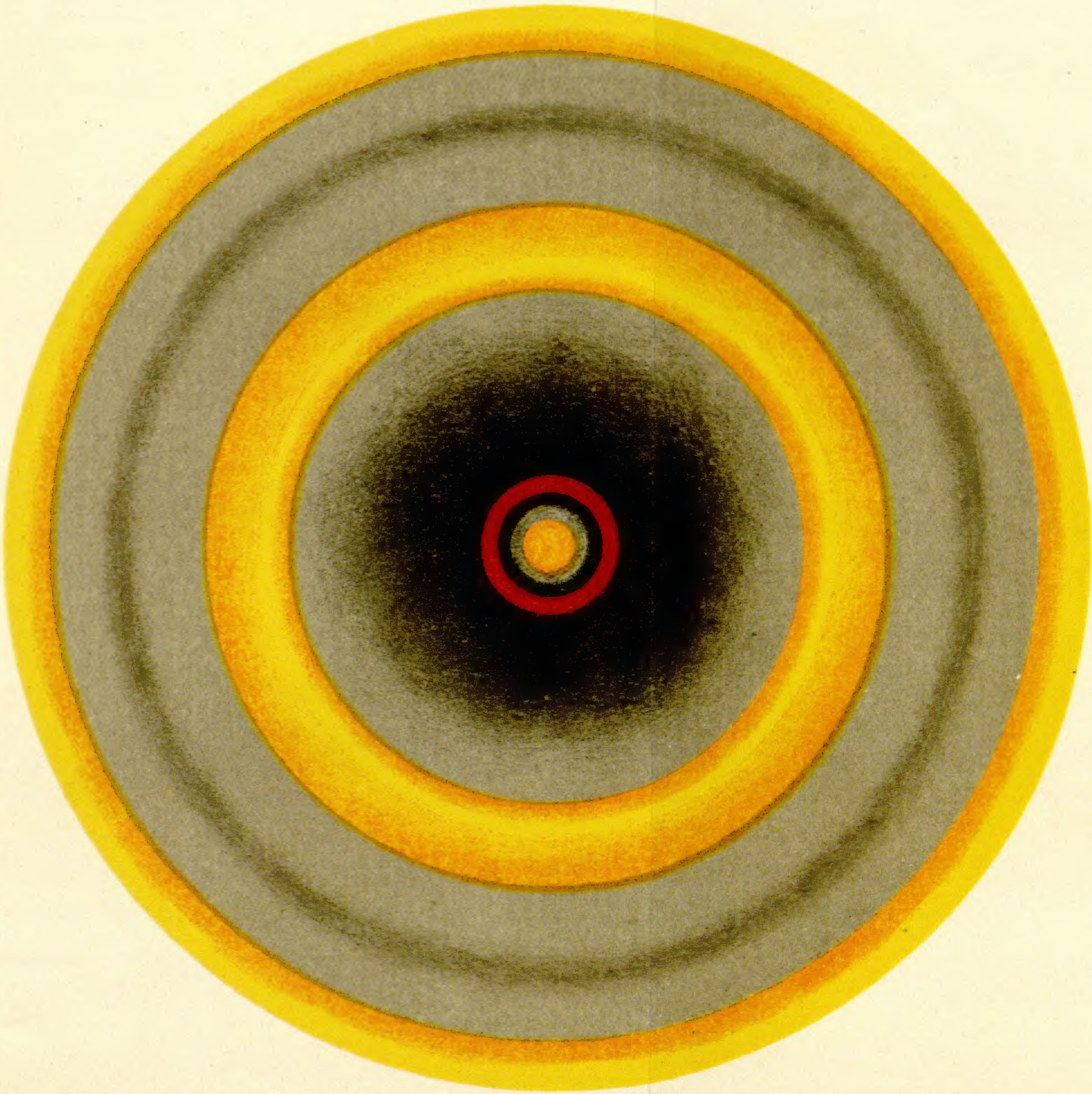

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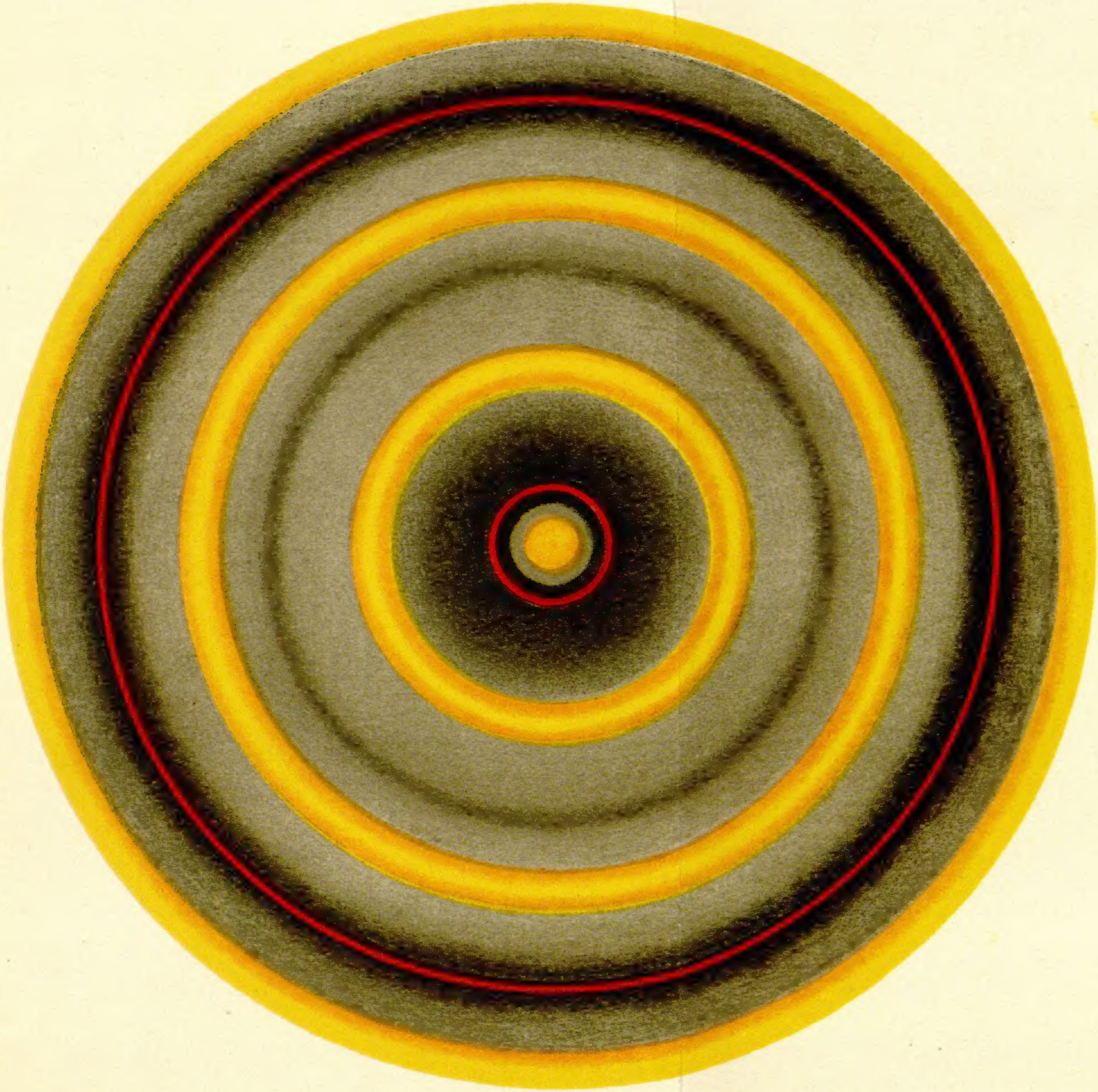

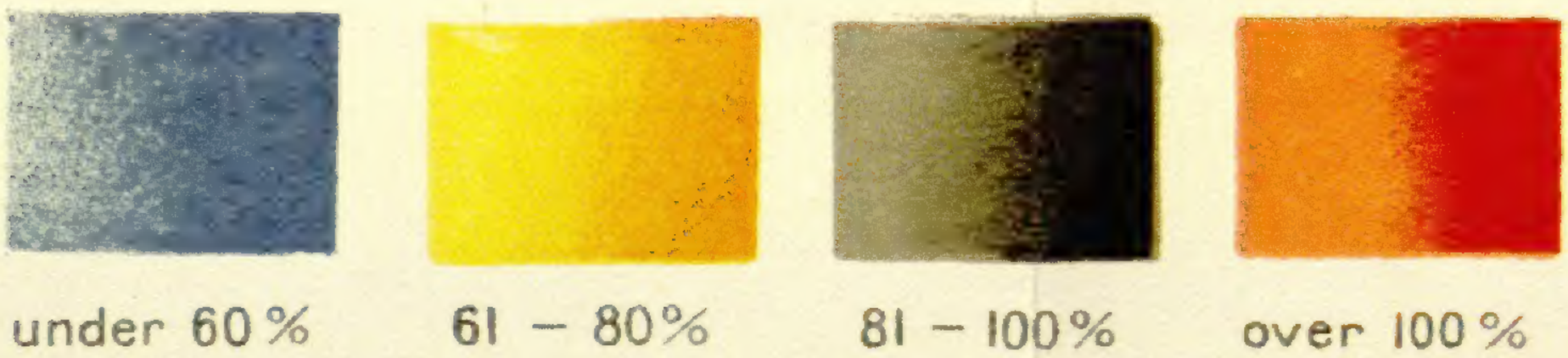
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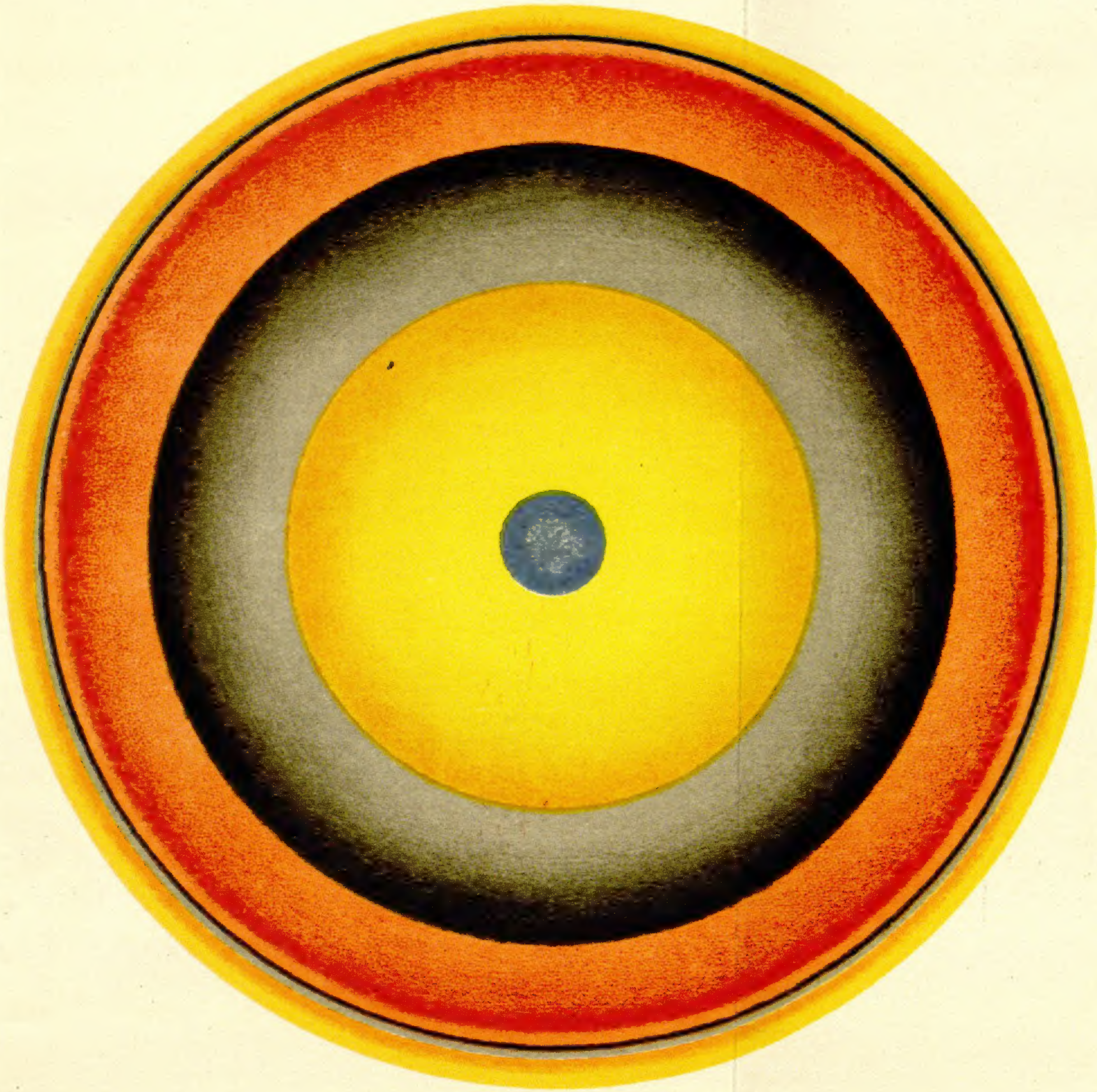

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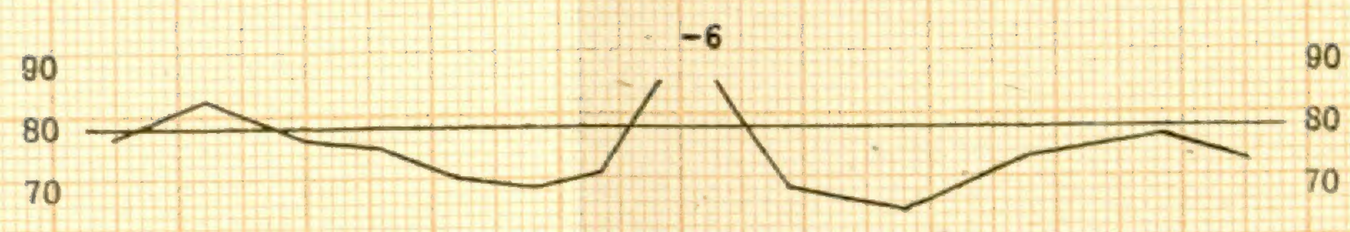
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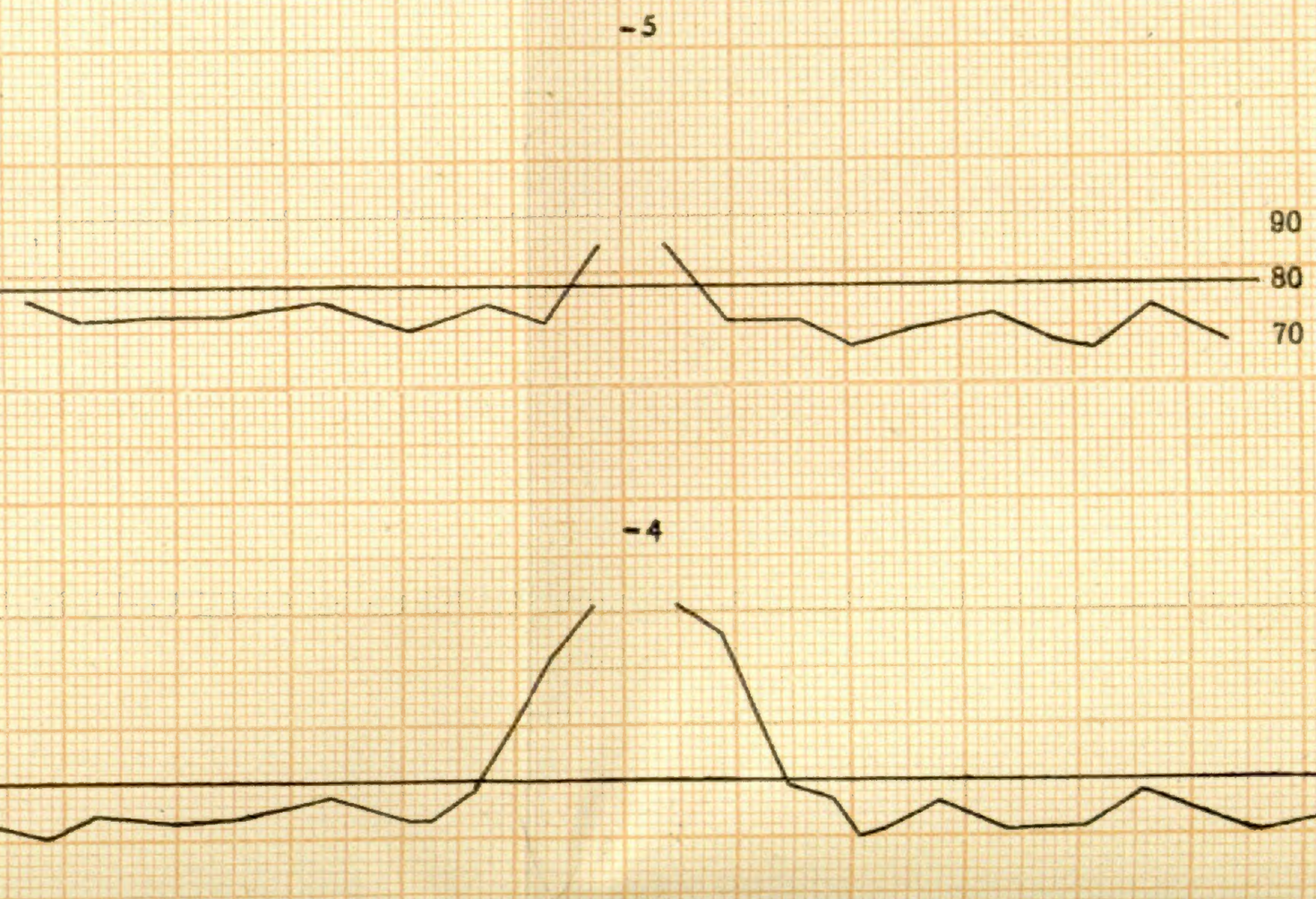
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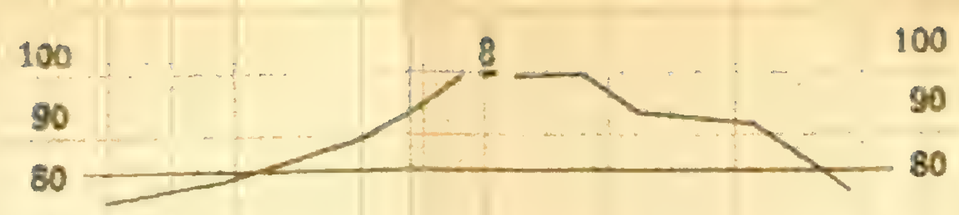
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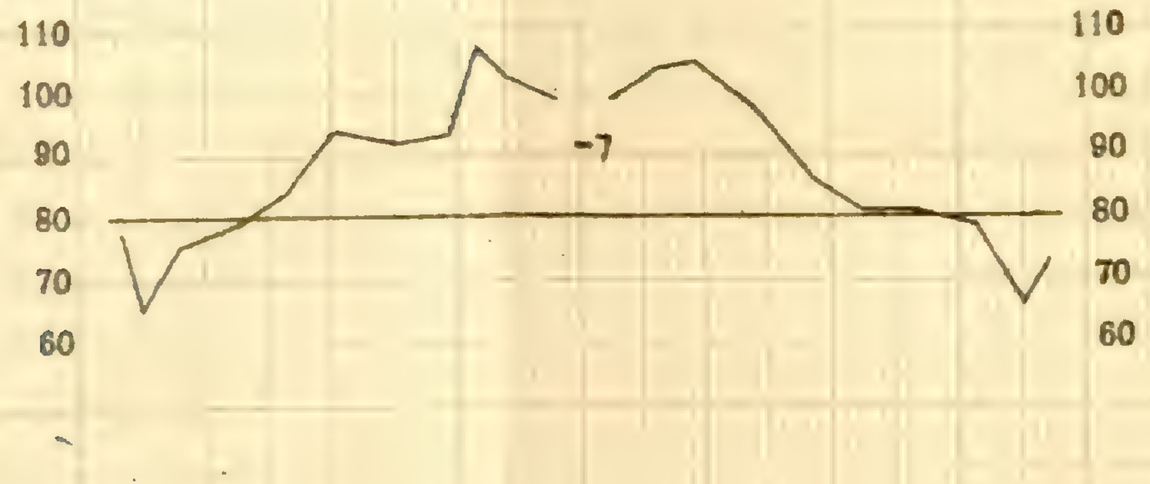
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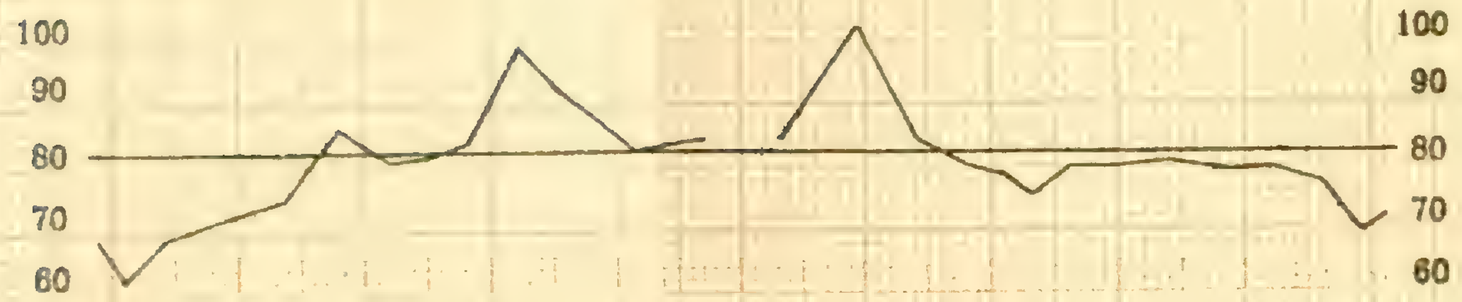
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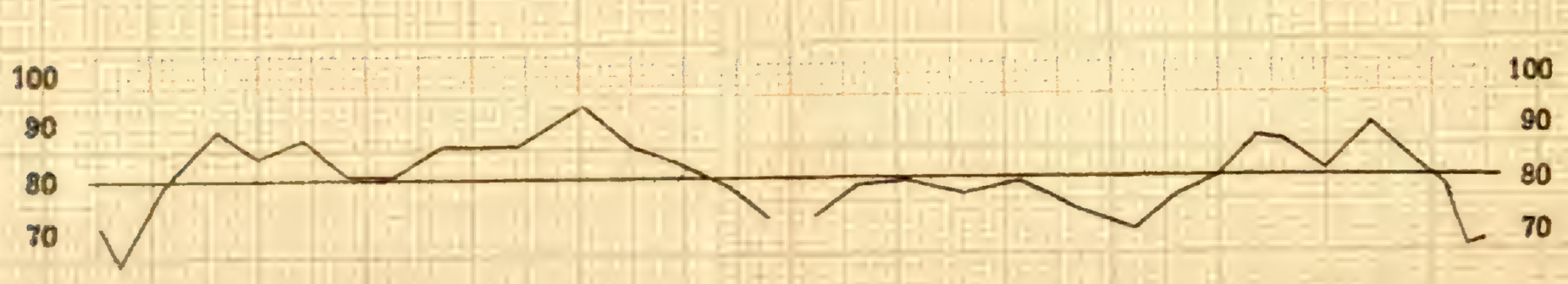
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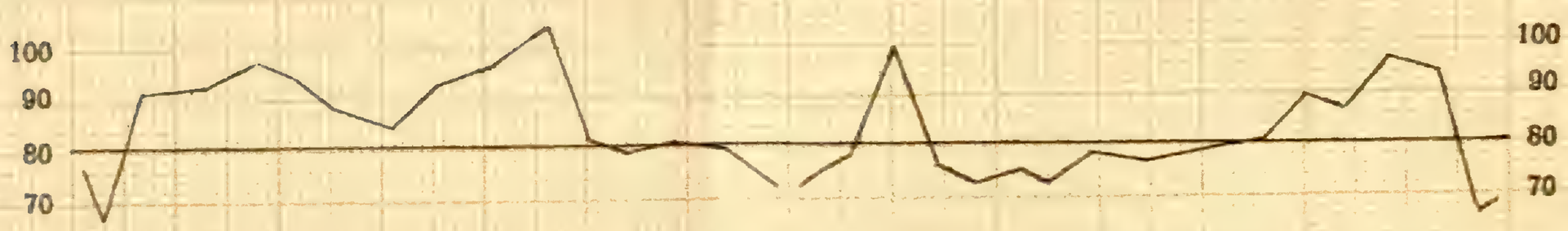
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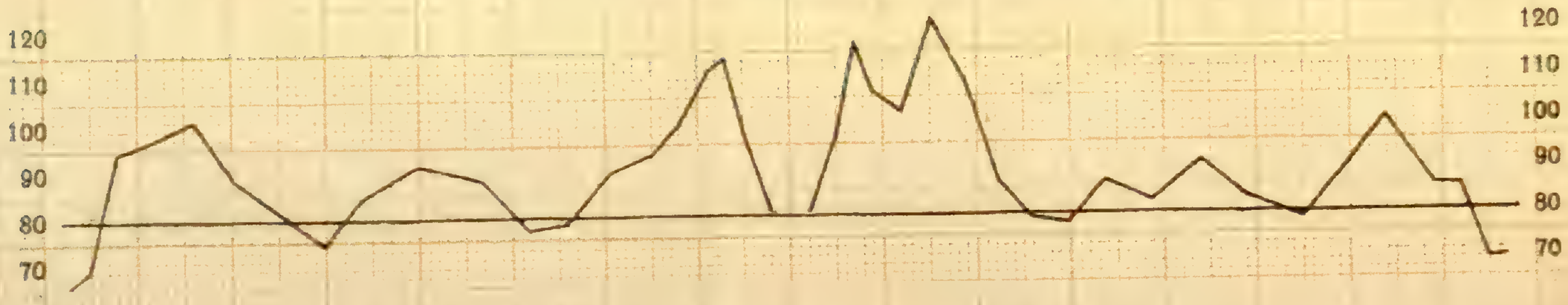
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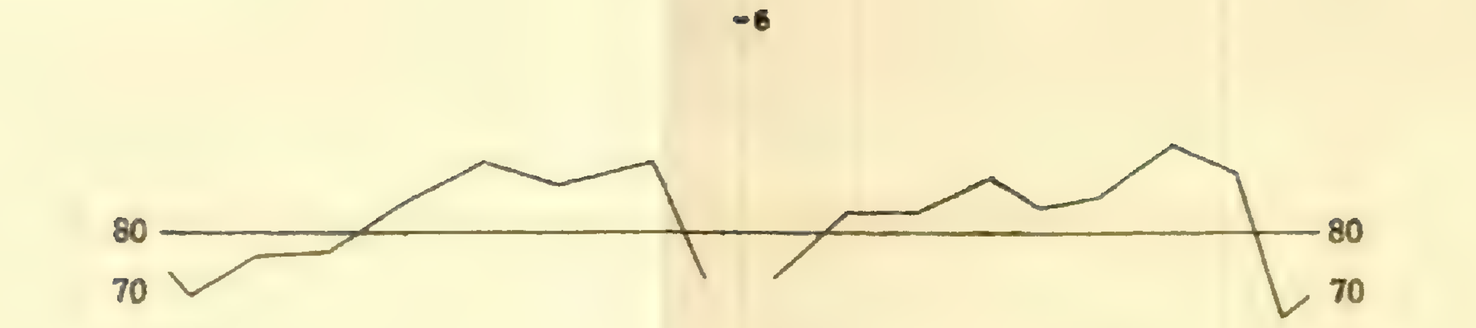
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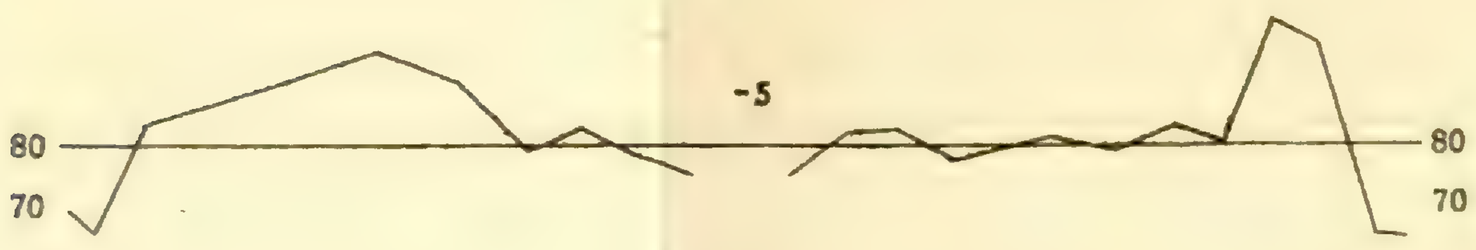
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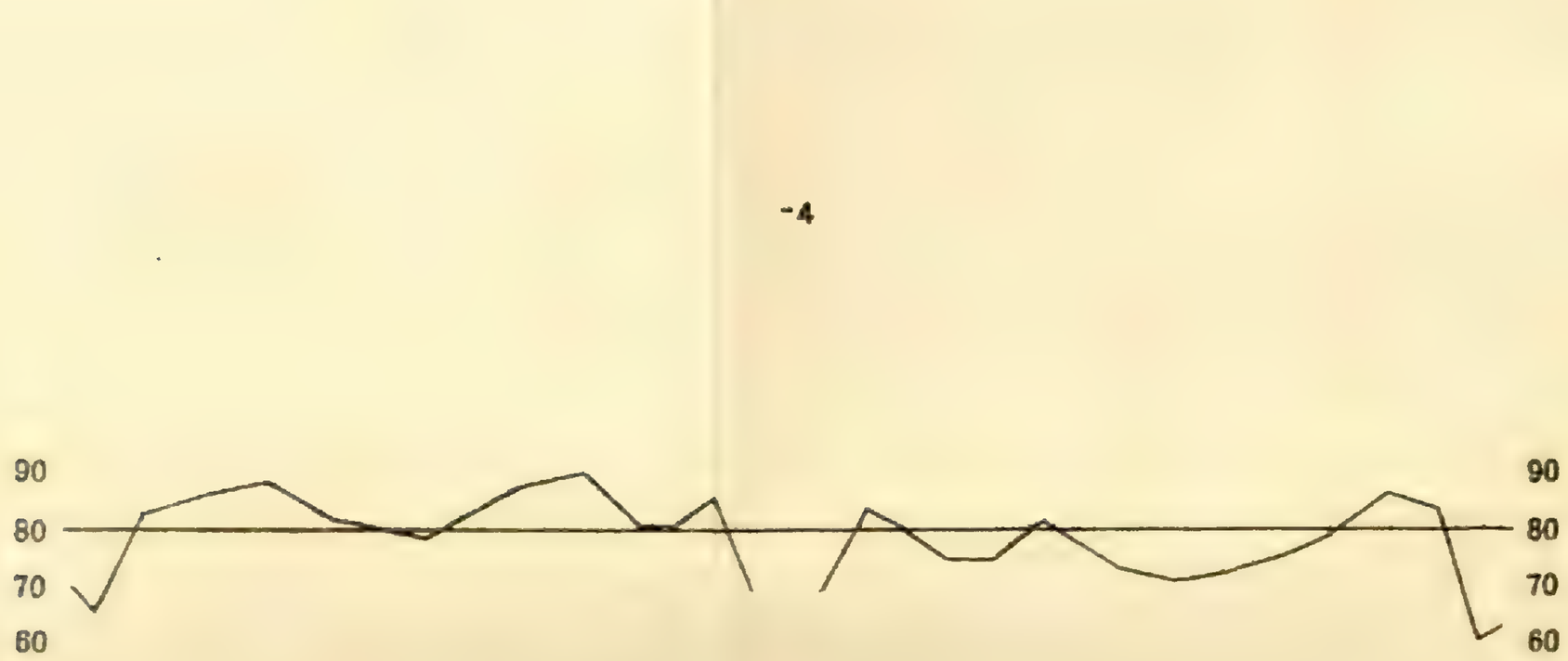
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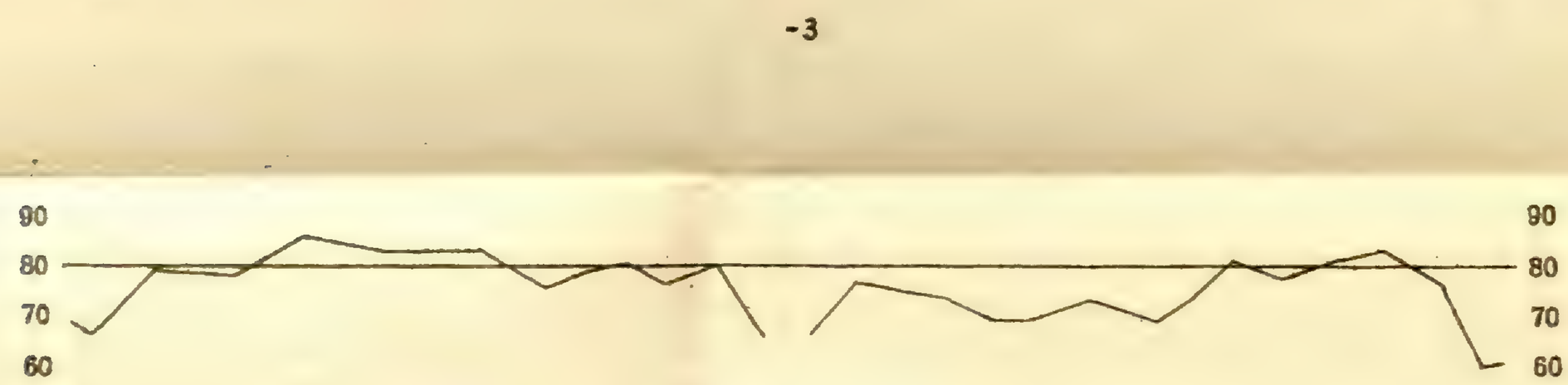
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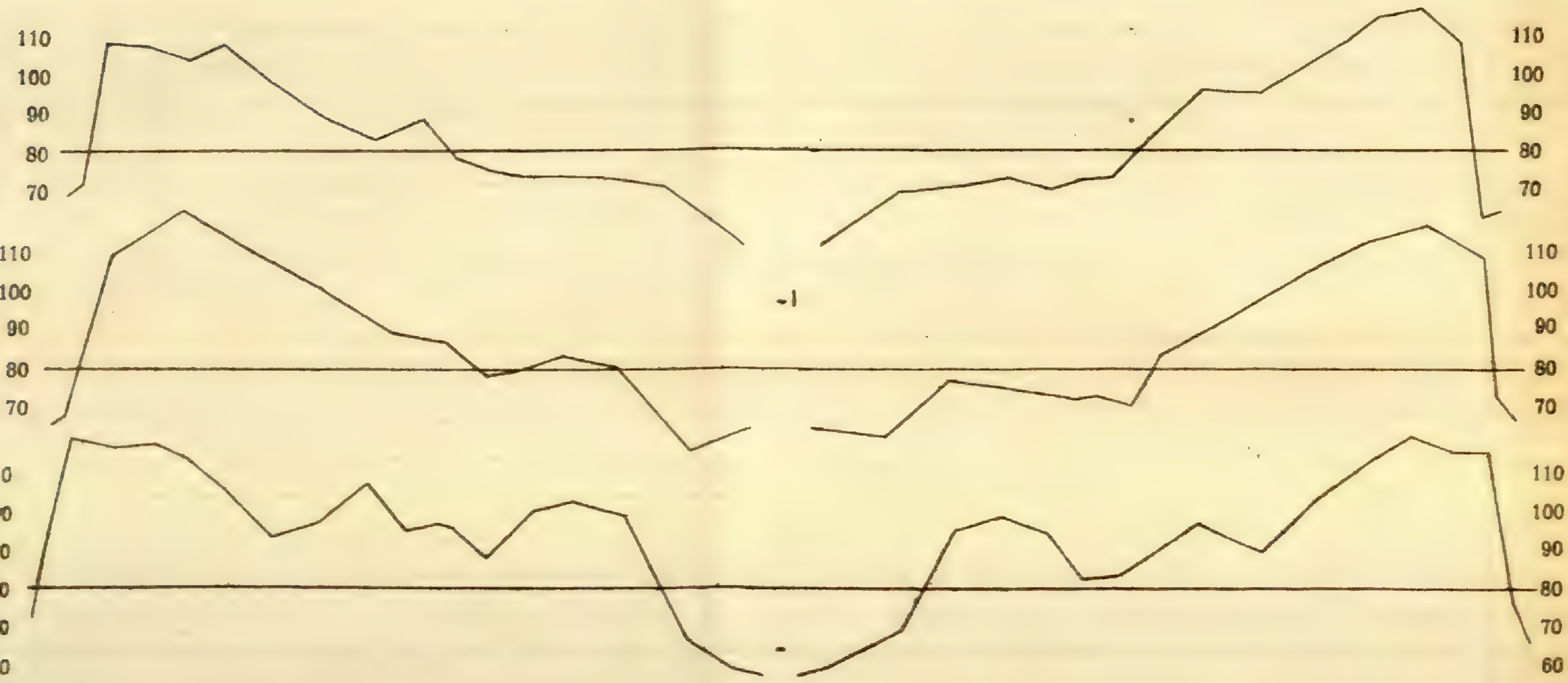
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Regional Spread of Moisture in the Wood of Trees.

I.—Deciduous-Leaved Trees during the Period late Autumn to early Spring.

BY

W. G. CRAIB, M.A.,

Lecturer on Forest Botany and Indian Forest Trees
in the University of Edinburgh.

With Plates CL–CLIX.

Results obtained from the determination of the moisture content of samples of more or less seasoned wood for the Air Board suggested problems the solution of which could be looked for only from an examination of fresh unseasoned wood. Material which might serve to clear up some of the difficulties was very fortunately to hand, for, on mentioning the matter to Professor Balfour, I was informed that preparations had been made for felling two trees—an *Acer* and a *Platanus*—in the Royal Botanic Garden that day. Both trees were placed entirely at my disposal, and, as will be mentioned later, the results obtained served to emphasise our lack of knowledge on the question of the spread of moisture in deciduous trees. Examination of some other species at this time confirmed the main results obtained from these two trees.

Two possible lines of investigation suggested themselves: the examination of as large a number of deciduous trees as possible in the so-called dormant or inactive condition, or concentration on one particular species and the determination of the moisture spread at intervals throughout its leafless period. The former seemed to offer a fruitful field for study, but the latter was selected in spite of the fact that the terms dormancy or inactivity, as applied to the leafless condition of trees, suggest stagnation and would predicate no change in the moisture distribution from the time of leaf-fall until the buds open, or at least until they begin to swell.

The species selected for examination was *Acer Pseudoplatanus*. All the trees examined were grown under similar conditions in the Royal Botanic Garden, and all were about forty years old. Doubts might be raised of the expediency of basing any generali-

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sation on results obtained from a set of trees grown under similar conditions, *i.e.* subject to the same external factors. But the main conclusions of my investigation are such as appear to be independent of the influence of external factors except to the extent that the stage reached in the moisture spread at any particular time will, in an early district, be correspondingly in advance of that at the same time in a late district, *i.e.* the main conclusions apply generally to the species. From such observations as I have been able to make on other species of trees, I infer that my conclusions based upon *Acer Pseudoplatanus* may, with but slight modifications, be regarded as applicable to most if not all broad-leaved deciduous trees here.

Method of Procedure.—When the first tree was felled in October I was faced with the problem of how to utilise it to the best advantage so that

(1) the results would give some satisfactory idea as to the distribution of moisture throughout the trunk, and
(2) the work done on this tree might serve as a guide to the method to be followed in any similar work in the future.

With these objects in view, I finally decided to use three transverse cuts from the bole (from near ground level, from near the top of the bole, and from a point nearly midway between these two) and also two transverse cuts from the crown (one from near the bottom and one from about the middle of the leader). These five cuts were all about 4 cm. thick, and were all sawn off just after the tree was felled. Of each cut I used a strip of 3–5 cm. breadth from the outside to the centre. Each of these strips was then chipped up into smaller blocks, the moisture percentage of each of which was determined separately.

As already mentioned, the work done on this tree was to be regarded, to some extent at least, as experimental. How far this is the case may be understood by stating that whereas in this tree the moisture percentage of only some 66 pieces was ascertained, in the remaining trees the numbers were 278, 386, 394, and 407.

Generally in these trees six transverse cuts were selected, three from the bole, as in the October tree, and three from the crown, the third one here being taken from higher up on the leader. The larger number of pieces examined from the later trees is accounted for by two facts :

(1) the individual pieces were much smaller, and
(2) instead of using one strip from the outside to the centre, I used four strips from each transverse cut.

The small blocks were put in a drying oven which was kept at 100–105° C., and weighed at intervals of twenty-four hours until the loss per cent. in a twenty-four hours' period was less than 0·5 per cent. The moisture content of the original block was taken as the loss of weight in drying, and this moisture content, expressed in terms of the dry weight, was calculated separately for each block.

Graphic Representation of Results (Plates CLV–CLIX).—After calculating the moisture content of a number of specimens, I decided that probably the best method of illustrating the results throughout each tree was by graphs rather than by the tabulation of series of figures. The number of rings in each of the transverse cuts is plotted horizontally (2 mm. = 1 annual ring), and the moisture percentage vertically (1 mm. = 4 per cent.). In each case the line representing the middle line of the transverse cuts is taken as a base line representing a moisture content of 80 per cent., and these base lines are spaced out proportionately to the distances of the transverse cuts above ground level. The points plotted are the middle points of the small blocks as determined by the number of annual rings in each. No attempt whatever has been made to give the resulting polygons the appearance of graphs, as I thought it advisable in this preliminary investigation merely to join up the actual points plotted.

In examining these graphs it should be noted that whereas the general trend of the graphs is comparable, any particular series of similar points may not be strictly comparable, *e.g.* the first observations in the cuts of the October tree (see Plate CLV) from below upwards represent the moisture percentage of the outer one, four, six, two, and seven years' wood respectively.

In the case of the October tree (see Plate CLV), the left-hand side represents the younger wood and the right-hand side the centre of the tree. In the remaining trees (see Plates CLVI–CLIX) the oldest wood is in the centre of the graphs and the youngest wood at the right- and left-hand sides, *i.e.* in the October tree the graphs represent the moisture distribution from the outside to the centre, whereas in the remaining trees they represent the distribution from the outside to the centre in two directions.

Coloured Illustrations (Plates CL–CLIV).—In addition to the graphs which, as stated, give the moisture distribution throughout the trunk of the tree, an attempt has been made to show diagrammatically the stages through which each part of the trunk passes in the leafless period. The circles represent the transverse section of the trunk, and the colour distribution corresponds to the moisture distribution. It must be noted here

that whereas these diagrams represent the average state of the bole of the trees examined, the whole length of the bole is not necessarily at the same stage at any particular time, and in fact very seldom are even the quadrants of any one section in exactly the same phase at one time.

Dates and Method of Felling Trees and of Cutting the Selected Transverse Sections.—The first tree was felled on the morning of 24th October 1917 when only a few half-withered leaves remained on the crown, *i.e.* at the time when foliar activity had just ceased for the year and at the commencement of what is usually regarded as the tree-felling season. Preparatory to felling the top of the crown was taken off, as were also the main branches, the latter being sawn off at about 1 m. from the trunk. Immediately after felling the trunk was taken to a sawmill close by where the cuts selected were sawn off.

The second tree was felled on 14th December 1917, in the afternoon. For convenience of felling some branches were cut off at about 1 m. from the trunk, but otherwise the tree was felled entire. Immediately after felling the bottom cut selected was sawn off. Next morning the remaining five selected cuts were sawn off, and the work of chipping up and weighing was completed on the following day.

On the morning of 5th January 1918 the third tree was felled. In this case only one branch was removed preparatory to felling. Felling took place in the middle of the severe snowstorm then being experienced and during hard frost. Just after felling only the bottom selected cut was sawn off. After work was finished on this cut an examination of the tree showed that it was bleeding rather freely from the cut branch and from another near it which had been damaged in felling. On account of the bleeding I had all the remaining cuts sawn off, and these were stored in a cool place during the remaining two days necessary for the chipping up and weighing. As bleeding from cut branches has been mentioned, I may state that this was the only tree of the series on which bleeding from small or main branches was observed.

The fourth selected tree was felled early on 4th February 1918. The tree was felled quite entire, there being in this case no necessity to remove branches preparatory to felling. All the selected cuts were sawn off immediately after felling, and no branches were removed from the crown until it was necessary to do so for sawing operations.

On 23rd March 1918 the fifth tree was felled quite entire in the morning. Immediately after felling all the selected cuts were sawn off, and the work of chipping up and weighing was proceeded with continuously till finished.

Several trees have been examined since the date of the one last referred to, and it is intended that the work should be continued throughout the summer. In the meantime, however, it has been decided to publish the main results derived from the examination of the five trees enumerated. This course of action has been decided on primarily from practical considerations. Under present conditions, when all questions affecting timber are of the utmost importance, it is desirable that any new facts bearing on the subject should be published as soon as possible, and, moreover, since the period under survey—October to March—includes the extreme limits of what used to be regarded as the felling season, the results supply us with some definite knowledge as to the varying moisture spread in *Acer Pseudoplatanus* throughout the felling season. From a more scientific point of view the course of action is based on the consideration that the five trees have been examined at various times throughout a distinct phase of the tree's life, viz. the dormant or, as it is often loosely and erroneously called, the inactive period. The first tree was examined at the time when foliar activity had just ceased for the year, and in the March tree the buds were almost on the point of bursting. Many problems of scientific interest have arisen in the course of the work, but discussion of these must be omitted for the present as far as possible. The main question to be dealt with in the present paper is: What is the moisture distribution in felled timber throughout the felling season? A true appreciation of these new facts and their practical bearing would appear to be desirable, if not essential, for the successful handling of timber.

With this object in view, I have decided to treat the trees seriatim, giving under each tree the main results derived from its examination, and afterwards to give a summary of the main conclusions for the whole period.

Results obtained from the October tree:—

1. That as regards the bole the *centre is decidedly the richest in moisture*, and that as regards the crown the region of maximum content is also in the central area, but some little distance from the actual centre.

2. That the moisture percentage of the *centre decreases upwards*.

3. That the outer few years' wood contains a comparatively large amount of moisture.

4. That the percentage of moisture in the *youngest wood increases upwards*.

5. That between the two regions of maximum content there is a region of lower moisture content, the moisture content, however, showing a more or less uniform increase towards the centre, and

6. That the *lowest section shows most markedly the pronounced accumulation of moisture in the centre.*

Although the graphs showed a transition in the matter of moisture content, more or less easily traceable from that of the lowest to that of the highest cut, it was not quite clear how the graphs should be correlated. Imbued with the prevalent idea that the dormant condition into which a tree passes on losing its leaves presupposes practically no movement of moisture during that period, I expected to find a more or less uniform distribution of moisture in the transverse sections at least of the bole. And again I could not account for the large accumulation of moisture in the centre. Was it a relic of the active season just ended, a condition which would prevail throughout dormancy, or was it the commencement of some new movement consequent on the stoppage of foliar activity? And another phase of the problem was: Were the results obtained characteristic of the species for the time of year or rather for this particular stage in the tree's cycle, or were they peculiar to the particular tree examined?

I had these points particularly in mind when the second tree was felled in December. From it the following main results were obtained:—

1. That the *central region is the richest* in moisture.

2. That the moisture percentage of the *centre increases upwards* until the first cut from the crown is passed, and that *above this there is a marked fall* in moisture in that region.

3. That the *younger wood is no longer a marked maximum area.*

4. That the percentage of moisture of the *extreme outside rings* tends, on the whole, to *increase upwards*, and that this percentage is lower than in October.

5. That there are indications in the lower cuts of a new disposition of the moisture, viz. that *the region of maximum moisture is moving away from the centre*, and

6. That *this movement is most pronounced in the lowest cut*, and becomes less marked upwards.

What, then, has happened between October and December? Comparison of the two sets of graphs for these months shows that the absolute moisture content is greater in December than in October. The additional moisture is probably due to root activity, the expression of which is shown in the younger wood in October, where, as already indicated, there lies one of the regions of maximum moisture. Reduced root activity is probably responsible for the lower percentages of moisture of the younger wood in December. Transpiration is then at its minimum and may, for the present, be regarded as negligible; I do not mean to infer that transpiration in winter is wholly

negligible, but that for present purposes it is probably a negligible quantity. The roots being still active and transpiration being negligible, how is the additional water disposed of? A glance at the graphs will, I think, readily answer this. It will be noticed that the graph of the fourth cut of the December tree is very similar to that of the lowest cut of the October tree, except that the percentages in the intermediate region are slightly higher. From this similarity, and from the gradations of moisture spread traceable between the first and fourth cut of the December tree, it is not unreasonable to presume that in the interval between October and December the graph of every part of the trunk up to and including the lower part of the crown would be at one time or another, though not simultaneously throughout the whole area, similar to that of the lowest cut of October or the fourth cut of December. In other words, water resulting from continued root activity is no longer required, to any great extent at least, in the crown, and is stored up in the centre of the tree until a condition represented by the lowest graph of the October tree, but with slightly higher percentages in the intermediate region, is attained. The reason for predicating this slightly higher percentage is that from comparison with other results I believe that the October tree was felled just before storage was completed in the lower part of the bole.

Before leaving the December tree we must note that both the storage of moisture in the centre of the trunk and the movement of the maximum moisture region away from the centre commence at the bottom of the trunk.

Just as was the storage of moisture in the centre of the trunk in October, so was this radial movement of the maximum moisture region of which we have just seen the commencement an unexpected happening. Was there any justification for comparing the two sets of graphs and drawing conclusions from them, or did the two sets of graphs differ no more than what might be expected from any two trees taken at random?

To test the validity of the conclusions drawn from a comparison of results obtained from the October and December trees, the third tree was felled in the middle of January. This tree gave the following results:—

1. That the *central region* is still the *richest in moisture*.

2. That, with the exception of the bottom cut, the moisture percentage of the *centre increases upwards*, and that this increase continues up to the top cut selected.

3. That the moisture content of the outer few years' wood resembles that of December.

4. That, although the percentage of the extreme outsides is rather erratic, there would appear to be some relationship

between this percentage and the disposition of the moisture in the inner parts of any one transverse cut. Apart from this bare statement I reserve comment on the point.

5. That the *movement of the maximum moisture zone away from the centre*, of which we saw the commencement in the December tree, is now *very pronounced*, and

6. That, as before, this movement is *most pronounced at the bottom of the trunk.*

In addition to the results summarised above, it may be noted that the examination of the January tree removed any lingering doubts as to the main conclusions being of general application to the species.

Comparison of the graphs for December and January shows that in the interval the trunk as far up as the highest selected cut has completed its storage in the centre, and at the top is apparently—from the shape of the graph—already moving out of that condition.

Doubts as to whether the results were applicable to the species or only to the individual were now replaced by doubts as to whether external factors were influencing the moisture distribution. The resulting graphs showed such marked inequalities in the distribution of the moisture that there appeared some justification for the supposition that the extreme frost experienced about the time of the felling of this tree might have been acting as an arresting or retarding agent. In these circumstances it became necessary to examine another tree.

To summarise the results obtained from the February tree would be but to repeat what has been written for the January tree. One very important result was, however, obtained, namely :—

That a *powerful external agent*, represented by the extreme frost of January, *had apparently no effect* whatever on the moisture movement.

And again more marked than in the January tree is the diminishing moisture content of the outer few years' wood.

To what extent would the concentration of moisture towards the outside proceed? And would it be possible to trace it before the new factor of root activity commenced?—were questions which now suggested themselves. By this time I had formed the opinion that this stored moisture would probably not be called on until the buds had burst. In the February tree the buds had just perceptibly swollen, and, though not without some hesitation, I deemed it safe to leave the examination of the next tree until the buds were just on the point of bursting.

As already stated, the fifth tree was felled towards the end of March. On a cut branch placed in water several buds were open on the third day after felling.

Summary of results from the March tree :—

1. That the *central region* is practically throughout the *most deficient* in moisture.

2. That the moisture percentage of the *centre increases upwards*.

3. That the *outer two years' wood is comparatively dry*, and

4. That the *maximum moisture region is now most markedly on the outside*, just inside the two-year-old wood.

The facts which I have stated seem to justify the following statements :—

With the decrease or certainly with the cessation of foliar activity for the season the tree immediately commences its preparations for the next season. The first phase of its activities is the storing up in the centre of the trunk of a large supply of moisture. This storage commences at the bottom of the trunk. Until a full explanation of the process or processes is available, it will be more convenient to designate this the *storage condition*. By the time that the centre has received its quota of stored moisture far up the trunk, another movement has begun causing a rearrangement of the moisture at the base of the trunk. I do not say that the two movements are absolutely independent. One may be governed by the other, but for lack of understanding of the processes involved, I find it more convenient for the present to speak of them as distinct.

With this proviso, and as I interpret the phenomena, the processes may be in brief general terms stated thus :—

As the result of the water moving inwards from the outer zones, beginning at the base of the trunk there is created an area of maximum moisture content in a transverse plane at the centre of the trunk. This inward current and the consequent plane of maximum moisture content at the centre gradually extends upwards in the trunk to the topmost region, but before this is reached and the centre of the trunk at the top of the bole has become a storage region of maximum moisture content a radial movement has begun at the bottom of the trunk which likewise progresses upwards, and through it the region of maximum moisture content passes almost to the outside of the trunk, leaving the centre as the dryest region. The movements upwards and radial, both inwards and outwards, are going on synchronously at different levels in the trunk.

One point which may not be without its practical bearing

is that the bole and crown parts of the trunk are in continuity so far as these processes are concerned. The reason for examining two transverse cuts from just below and just above the lowermost branches of the crown was that I had thought the branching might have some influence on the moisture disposition. In this I was evidently mistaken, so far at least as the winter condition is concerned, for the graphs show no sudden change at the junction of crown and bole.

A glance at what I have spoken of as the intermediate region in the storage condition shows that in the graph it is represented almost by a straight line rising gently towards the centre. For the purposes of plotting results the units for the annual ring and for the moisture percentage were finally fixed by trial, so that this region should be represented by almost a straight line. The reason for this was that in the storage condition it was observed that this intermediate region showed a steady increase in moisture percentage towards the centre wherever the annual zones of wood were at all uniform. Higher percentages resulted from close-grown timber and lower from faster grown. Hence for evenly grown timber I believe the graph of that part would be represented by a straight line. That narrow annual rings contain higher percentages of moisture finds its counterpart in the various methods for preserving timber by impregnation, where, I believe, it has been found that more of the preservative is absorbed by narrow- than by wide-ringed wood.

As already stated, this survey includes the extreme limits of what used to be regarded as the felling season. From the time that, to use the common expression, " the sap was down " to the time " the sap was up " was it not generally accepted that the moisture content was uniform or nearly so ? I have qualified this statement as to uniformity somewhat because increase in the total amount of moisture present in a deciduous tree in its leafless condition had already been proved.* Hartig states that the moisture-content of Birch increases from September when it is at its minimum, to March when its maximum is reached, and that in the case of Beech the month of maximum moisture-content is December. These results, it must be borne in mind, are applicable to Central Europe, and need not necessarily be absolutely true for this country. No statement was hazarded as to which part of the tree took up additional moisture or as to how this moisture once in the trunk was got rid of. The expression " the sap is down," I think I have proved meaningless as regards *Acer Pseudoplatanus* at least. There is an ascent of sap throughout the season, as

* R. Hartig, *Untersuch. a. d. forstbot. Inst. Münch.*, II.

shown by the leader some little distance behind the top of the crown not completing its storage until well on in the season. If expressions regarding the sap are to be used, they must be, in view of what I have shown, some such as " the sap is in " or " the sap is out."

During the felling season, then, trees with very varying moisture distribution are being cut down. At the beginning of the season the centre of the tree is very wet, at the end of the season there is a very wet region almost on the outside and the centre is very dry. Between these two extremes there are all the intermediate stages. Which is the best condition from the point of view of the seasoning of the timber ?

Are not the main reasons for winter felling of deciduous trees simply :

1. Custom.
2. Availability of labour.
3. Absence of leaves overhead and consequent light penetration.
4. Damage to undergrowth reduced to a minimum, and
5. The slower seasoning of the timber and risk of cracking reduced to its minimum ?

There is in this country a deeply rooted prejudice against summer felling. Asked his reasons against summer felling, a forester will usually give his individual interpretation of " the sap is then up." This expression has already been dealt with and no longer holds as an argument against summer felling. Though undoubtedly there is a greater supply of labour available in the winter, labour has no bearing on the present question and cannot be treated of here. Long-established custom can, I am afraid, be changed only by necessity. But in the present times even this deep-rooted custom has had to yield, at least in many cases. Kiln-seasoning has now been so far perfected that, according to some authorities at least, the quality of the timber is in no way reduced by the artificial method. Does the distribution of the moisture at the time of felling affect in any degree the successful artificial seasoning of the timber ? The first stages of the artificial method may be regarded as providing a safeguard against any defects which might otherwise arise from inequalities of moisture distribution in the untreated timber.

There is one other way of regarding the results of the present investigation with respect to the popular opinion on sap distribution. Trees at the commencement of the felling season are very wet in the centre, at the extreme end of that season the bulk of the moisture is on the outside, and during the season there are all the intermediate stages between the two.

Reasons against summer felling have been advanced based on the quality of the timber cut then. I have seen no proof that summer-felled timber is poorer in quality than winter-felled. It is possible that seasonal variations in the composition of the sap, apart altogether from the question of the amount of sap, may result in the walls of the various tissues being differently impregnated during seasoning. But such speculations lead us into the question of what seasoning really is, and what chemical reactions are involved—still a practically untouched field of study.

Having dealt with the expression "the sap is down," I feel that something must be said of its companion "the sap is up," even although in doing so I go beyond the trees dealt with in this paper. "The sap is up," or, as occasionally put, "the sap is in the bark," refers to the condition when the bark is easily separable from the wood, and this condition of easy separation is the result of the cambium swelling up preparatory to the year's growth. Results obtained from more recently examined trees show that for this condition it is unnecessary to predicate root activity. A more accurate expression would probably be "the sap is out in the bark."

To the practical man several queries may now suggest themselves: Are these new facts as to moisture movements to be regarded as of general application to *Acer Pseudoplatanus*, wherever grown? and further, Can anything be said as to other deciduous trees?

To the first query I can only reply that all the trees examined were grown under similar conditions, and that I have, therefore, no actual experimental evidence on the point. The impartial reader will, however, grant me, I think, that the results are not such as lend themselves to explanation by the bringing in of environmental factors. It has already been shown that one very potent external factor—severe frost—had apparently no effect whatever on the movement or movements of moisture. The actual moisture percentages and the stage reached at any particular time may be, and I have little doubt will be found to be, influenced by external factors, but I see no reason whatever for not accepting my general conclusions regarding the spread of moisture in this particular species.

Do all deciduous broad-leaved trees in temperate regions behave in a similar way throughout their leafless period? Although I believe that with slight modifications of detail the process will eventually be found to be of general application, it is yet too early to be quite positive on the point. It may be well to give such evidence as I possess which leads me to state this belief.

1. *Platanus acerifolia*, about forty years old, felled on the same day as the October *Acer*, gave the same general result as the *Acer*, viz. a decided accumulation of moisture in the central area, and what appeared to be the commencement of storage in this region in the two next higher cuts. The percentages were higher throughout the lowest cut, but the chief differences of detail were that there was a decline in the percentage right to the storage region, and this region was not the actual centre but some little distance out from the centre. Was the latter detail influenced by the fact that the tree had lost the top of its crown a year or two previously?

2. *Betula pubescens x verrucosa* (felled 2nd January 1918) and *Betula verrucosa* (felled 24th January 1918) have given, as far as the results have been worked out, very similar graphs to those of the December *Acer*.

3. *Crataegus Oxyacantha* (felled 5th March 1918). Here once more I find myself wandering beyond the limits set in this paper, since the buds were just open on this tree at the time it was felled. However, the results, as far as at present available, tend to confirm the wider application of these new facts since they are similar to those of the *Acer* in the same condition.

Of true heart-wood trees I have but scanty information.

1. A very old tree of *Ulmus montana* was felled in November, but unfortunately the centre was not sound. The results showed a sudden and very marked increase in moisture percentage immediately on entering the heart-wood.

2. *Quercus cerris*, thirty-four years old, felled 8th March 1918, gave results which, so far as available, correspond exactly with those of the similar cuts in the December *Acer*. From a solitary example, and that one with only some 6 cm. of heart-wood at the base of the trunk, it would be rash to draw conclusions, and yet the similarity of the curves suggests that in this case sap-wood and heart-wood are indistinguishable in their functions as regards storage and movement of moisture, *i.e.* the results gave no indications of two regions functioning differently.

From such evidence it would be unwise to draw inferences with regard to heart-wood trees. Arrangements have, however, been made to carry out as far as possible during this year the examination of a series of heart-wood trees on the same lines as that done for *Acer*. Whether heart-wood really functions uniformly with the sap-wood in these moisture movements cannot be answered until a series of some heart-wood trees has been examined.

Although this paper has been written from the more practical and utilitarian side, yet the new facts brought to light give rise

to not a few points of scientific interest. The leafless periods in the deciduous tree's life-history are usually referred to as the dormant periods. The aptness of the term "dormant" cannot be questioned, but when it is used, as it often is, to convey the meaning of inactivity it is quite wrong. Can these activities of the dormant period be explained on purely physical grounds? Why the recurring wave-like shape of the graphs? What part does the water which is involved in starch-hydrolysis play in the results as given? Why the extremely low moisture percentage in March of the younger two years' wood, with such large percentages just behind that region? Since I first became cognisant of these winter activities in *Acer* I have wondered whether they may not help us to understand better the reasons for the plan, and more especially the arrangement of the various pits on the different tissues. Up to now explanations have always been looked for in the leaf-bearing state. Is their chief function to control summer or winter movements? Or do they function equally in both?

In conclusion I wish to express my indebtedness to those who have helped me throughout this work. Professor Balfour, F.R.S., Regius Keeper, Royal Botanic Garden, has more than encouraged me to proceed with the investigations by the very liberal way in which he has placed at my disposal any available material which would aid the investigations. To Mr R. L. Harrow, F.R.H.S., Head Gardener, Royal Botanic Garden, I am also deeply indebted for the painstaking way in which he carried out the details of felling and other operations. Mr Spiers (of Messrs Souness & Spiers) has very kindly given immediate attention to the sawing off of the transverse cuts of several of the trees. To my colleague, Mr H. F. Tagg, F.L.S., I am also indebted for his very helpful criticism, whether constructive or destructive. To Miss L. Snelling I owe the preparation of the original coloured drawings of Plates CL-CLIV.

LIST OF PLATES (CL–CLIX).

Illustrating Mr Craib's paper on Moisture Spread in *Acer Pseudoplatanus*.

PLATE CL.—Average moisture distribution in bole in October.
CLI. " " " " December.
CLII. " " " " January.
CLIII. " " " " February.
CLIV. " " " " March.
CLV.—Moisture distribution throughout trunk in October.
CLVI. " " " " December.
CLVII. " " " " January.
CLVIII. " " " " February.
CLIX. " " " " March.

Explanation of Coloured Plates (CL–CLIV).

These coloured plates, it must be borne in mind, are purely diagrammatic. The colour scheme adopted, a copy of which is found below each diagram, is as follows :—

Moisture content under 60 per cent. of the dry weight of the wood—**blue.**
Moisture content from 61–80 per cent. of the dry weight of the wood—**yellow.**
Moisture content from 81–100 per cent. of the dry weight of the wood—**grey to black.**
Moisture content over 100 per cent. of the dry weight of the wood—**red.**

By the use of different shades of these four colours a nearer approximation to the actual moisture percentage can be shown ; in all four colours the deeper shading indicates a higher percentage, the lighter shading a lower.

Soon after leaf-fall (in October) the average moisture distribution, as seen in a transverse section from about the middle of the bole, is as shown in Plate CL. From the colour scheme it is readily seen that by far the larger portion of the section has a moisture percentage of 61–80, as indicated by the large area coloured yellow. The youngest wood—on the extreme outside—has a percentage of almost 80, and the moisture diminishes from this zone to its minimum for the whole section. This minimum occurs at about 5 mm. from the outside of the plate, as indicated by the blue circle denoting a moisture percentage of just under 60. Inside this minimum there is a gradual rise towards the centre, as shown by the more intense yellow, until near the centre, where there is a sudden rise from 81 to 100 per cent. (grey to black), which again is continued to well over 100 per cent. in the very centre (red).

In December (Plate CLI—which represents likewise the average moisture distribution in a transverse plane at about the middle of the bole) shades of yellow, indicating a percentage of 61–80, still predominate in the whole section. The very youngest wood—on the extreme outside—has here a slightly lower percentage than is found in October, and the percentage decreases inwards to about the same minimum region—about 5 mm. from the outside of the plate,—as noted in the previous plate. Near the centre we find the same steep rise to well over 100 per cent. (grey and black succeeded by red), but the area over 100 per cent. (red) is now considerably larger than in October ; and, moreover, it will be noticed that within this red area the

highest percentage, as indicated by the deepest shading, is now some little distance from the actual centre. As compared with the preceding plate, it will be noticed that the area bounded by the minimum near the outside and the sudden rise near the centre no longer shows a gradual increase inwards, but is broken up into a series of zones of secondary maxima and minima, with percentages, however, nowhere above 80.

By January (Plate CLII—which again represents the moisture distribution in a transverse section from mid-bole) conditions have been considerably altered, as shown by the very different appearance of the diagram. The dominant yellow (61–80 per cent.) is now replaced by grey and black (81–100 per cent.). The radiation of the moisture outwards from the centre has resulted in the very centre being below 80 per cent. (yellow), in the red zone (over 100 per cent.) being very much reduced, and in the larger yellow (61–80 per cent.) area of the previous two plates being now mostly grey to black (81–100 per cent.), the two larger 81–100 per cent. areas (grey to black) being separated by a zone of yellow (61–80 per cent.) in the middle. The extreme outside has here a slightly lower moisture percentage than the corresponding region in December, and, as in the remaining plates (CLIII, CLIV), shows an increase inwards instead of a decrease, as in Plates CL and CLI.

The diagram for February (Plate CLIII), illustrating in the same way the distribution of moisture at mid-bole, shows that in the interval the radiation of the moisture outwards from the centre has continued. This diagram bears the same relationship to Plate CLII that Plate CLII does to Plate CLI. Whereas in Plate CLII the bulk of the moisture was still not far from the centre, this central maximum is decreasing, and the moisture is reappearing as a maximum towards the periphery. For the first time we find red (over 100 per cent.) appearing in the outer region.

In the diagram for the moisture distribution in a transverse plane at mid-bole in March (Plate CLIV) we find that the horizontal spread has now gone so far that we have really almost the reverse of the conditions depicted for October (Plate CL). The lowest percentage recorded here is in the centre, which is below 60 per cent. (blue). Excluding the youngest wood, we had in October a gradual increase inwards from 60 per cent. to 80 per cent., and then a sudden increase from 80 per cent. to well over 100 per cent. in the very centre, whereas here, in March, we find a gradual increase outwards from below 60 per cent. at the very centre to 80 per cent., followed by a more marked increase from 80 per cent. to over 100 per cent. From this zone of over 100 per cent. (red) there is a sudden decrease to

80 per cent., and then a more gradual decrease to almost 60 per cent. The zone occupied by this black, grey, and yellow colouring denoting the decrease from 100 per cent. to almost 60 per cent. would correspond roughly to the area between the minimum noted for October (Plate CL) and the outside.

Plates CLI, CLII, and CLIII show intermediate stages in the moisture spread. Probably the best impression of what occurs in the way of moisture spread during the period under survey will be obtained from a comparison of the two extremes, as represented by the diagrams for October and March (Plates CL and CLIV respectively). The maximum region in October becomes the minimum region in March, and the minimum region of October becomes the maximum region of March: or, in terms of the colours depicted, red, indicating a moisture percentage of over 100, occurs in the centre of the trunk in October and in March only towards the periphery; blue, indicating a moisture percentage of less than 60, occurs in the centre of the trunk in March, and in October it occupies a circle roughly about 5 mm. from the outside of Plate CL.

Explanation of Graphs (Plates CLV-CLIX).

Whereas the coloured plates have been designed to show the average moisture distribution as seen in a transverse plane at approximately the same level in the bole of each of the trees examined, the graphs drawn on mm. paper give the actual results of the various experiments, and show the state of the moisture distribution throughout the trunk at the selected levels.

In each case metre distances above ground level are marked off vertically along the median line of the plate, and the centre line of each transverse cut examined is inserted in conformity with this scale according to its distance above ground level, as ascertained when the tree was felled.

In Plate CLV each graph read horizontally gives the moisture distribution at that particular level from the youngest wood at the left-hand side of the plate to the centre of the trunk in the middle of the plate. In the remainder (Plates CLVI–CLIX) we have, read horizontally, the moisture distribution from the centre of the trunk in the middle of the graph to the outside of the trunk in two directions at the extreme right- and left-hand sides.

The annual rings have been plotted horizontally (2 mm. = 1 year) and the moisture percentages vertically (1 mm. = 2 per cent.), so that an upward tendency of the graph signifies an

increase in moisture percentage at that place, a downward tendency a decrease. Further, the nearer the line approaches the vertical the more sudden is the increase or decrease, the less the line departs from the horizontal the more gradual is the increase or decrease depicted.

NEW SPECIES OF RHODODENDRON.

BY

PROFESSOR BAYLEY BALFOUR, F.R.S.

III.

OF the species of Rhododendron which are described in this paper, all but five have been discovered by George Forrest during his botanical exploration of Yunnan and the bordering area of S.E. Tibet in the years 1917 and 1918, and I owe to Mr J. C. Williams, of Caerhays Castle, the privilege of having them for examination. They are only a portion of the novelties in Forrest's collection. A description of others will fill many subsequent pages of these "Notes." Forrest has been collecting on the fringe of the chief centre of Rhododendrons in Asia. "From the collections I have made," he writes, "it appears fairly certain that the portion of the Mekong-Salween divide adjacent to Tsarong is richer in Rhododendrons than in species of any other shrubby or herbaceous genus." Again, writing of the distribution of Rhododendrons, he says: "The flora of South-West Szechwan (meaning any of that country lying east of longitude 100°) is poor in comparison to that of North-West Yunnan, especially in Rhododendrons. The whole lesson of my nine years' exploration of this region is told in a very few words when speaking of that genus: Travel north-westwards and the species are ever on the increase, break eastwards or north and there is a marked decrease immediately! From some point north-east of Tsarong the genus spreads out in a fan-shaped drift south and south-east, gradually thinning off in numbers as lowlands or plains are reached." All collections from West China confirm this broad generalisation. From the Tsarong many of the most beautiful of the Rhododendrons here described and to be described have been derived, and their habitats warrant the belief that they will be hardy in cultivation and not difficult plants to grow. It is unfortunate that for the moment Sino-Tibetan troubles make extended exploration in this rich region impossible.

[Notes, R.B.G., Edin., Nos. LII–LIII, January 1919.] A

Wt. 6105/142—375—8/19.—N. & Co., Ltd. Gp. 10.

The forty-five species of Rhododendron described here are :—

Rhododendron Albertsenianum, G. Forrest, p. 21.
" Baileyi, Balf. f., p. 23.
" bathyphyllum, Balf. f. et Forrest, p. 27.
" calvescens, Balf. f. et Forrest, p. 29.
" cheilanthum, Balf. f. et Forrest, p. 32.
" citriniflorum, Balf. f. et Forrest, p. 35.
" cloiophorum, Balf. f. et Forrest, p. 37.
" colletum, Balf. f. et Forrest, p. 39.
" comisteum, Balf. f. et Forrest, p. 42.
" dasypetalum, Balf. f. et Forrest, p. 45.
" detonsum, Balf. f. et Forrest, p. 48.
" dimitrum, Balf. f. et Forrest, p. 50.
" dryophyllum, Balf. f. et Forrest, p. 58.
" erastum, Balf. f. et Forrest, p. 60.
" eudoxum, Balf. f. et Forrest, p. 62.
" flavorufum, Balf. f. et Forrest, p. 65.
" Griersonianum, G. Forrest, p. 69.
" haemaleum, Balf. f. et Forrest, p. 71.
" leptopeplum, Balf. f. et Forrest, p. 82.
" leptothrium, Balf. f. et Forrest, p. 84.
" leucopetalum, Balf. f. et Forrest, p. 86.
" levistratum, Balf. f. et Forrest, p. 88.
" lochmium, Balf. f., p. 90.
" lophophorum, Balf. f. et Forrest, p. 95.
" Martinianum, Balf. f. et Forrest, p. 96.
" microgynum, Balf. f. et Forrest, p. 99.
" muliense, Balf. f. et Forrest, p. 101.
" orthocladum, Balf. f. et Forrest, p. 104.
" perulatum, Balf. f. et Forrest, p. 106.
" porphyrophyllum, Balf. f. et Forrest, p. 108.
" recurvum, Balf. f. et Forrest, p. 110.
" Reginaldi, Balf. f., p. 114.
" repens, Balf. f. et Forrest, p. 115.
" roseotinctum, Balf. f. et Forrest, p. 124.
" russatum, Balf. f. et Forrest, p. 126.
" russotinctum, Balf. f. et Forrest, p. 129.
" schizopeplum, Balf. f. et Forrest, p. 131.
" scleroclad um, Balf. f. et Forrest, p. 133.
" serpens, Balf. f. et Forrest, p. 135.
" setiferum, Balf. f. et Forrest, p. 137.
" stictophyllum, Balf. f., p. 139.
" syncollum, Balf. f. et Forrest, p. 142.
" temenium, Balf. f. et Forrest, p. 146.
" thyodocum, Balf. f. et Cooper, p. 148.
" tsarongense, Balf. f. et Forrest, p. 150.

Rhododendron Albertsenianum,* G. Forrest.†

Eglandular shrub about 2 m. high with stiff straight branches. Branches a year old about 2.5 mm. in diameter coated with a grey-white thin tomentum of floccose interwoven hairs becoming glabrescent, decorticating in the second year. Foliage-buds narrow oblong; outermost scale-leaves more or less rotundate below shortly keeled and tailed, the tail half as long as the base, outside thinly tomentose with buff-coloured interwoven hairs below, the hairs white in upper part, ciliate; intermediate scale-leaves oblong dull crimson-coloured slightly keeled mucronate clad outside like the outermost scale-leaves, ciliate; innermost scale-leaves ligulate-spathulate acuminate crimson in upper half, membranous ciliate as much as 4 cm. long 6 mm. broad; young leaves revolute in bud densely tomentose on both surfaces, hairs of the upper surface floccose branched from the base and upwards forming long unicellular pointed thick-walled curved and undulate branches which interlock, falling off shortly after expansion, hairs of the under surface persistent, of two kinds, rosette-hairs covered by hairs resembling those of upper surface. Leaves petiolate as much as 10.5 cm. long; lamina leathery narrowly oblong or sublanceolate as much as 9.5 cm. long 2.5 cm. broad, obtuse with a conspicuous red-tipped mucro, margin cartilaginous nearly plane, base oblique obtuse; upper surface olive-green somewhat shagreened (when dry) glabrescent but with vestiges of juvenile hairs particularly in groove of midrib, primary veins some 12–15 on each side slightly grooved; under surface buff-coloured with a prominent midrib, whole surface tomentose with a bistrate indumentum, the upper stratum of hairs with a long axis and many narrow unicellular pointed curved and undulate interwoven branches forming a woolly surface at first and later more or less detersile,

* Named in compliment to M. O. Albertsen, Chinese Maritime Customs. Tengyueh, to whom I am indebted for many kind services.—G. FORREST.

† *Rhododendron Albertsenianum*, G. Forrest. — Frutex eglandulosus ad 2 m. altus ramis strictis. Ramuli juveniles pubescentes glabrescentes mox decorticantes. Alabastrorum perulae extimae caudatae, intimae ligulato-spathulatae kermesinae. Folia ad 10.5 cm. longa; lamina coriacea anguste oblonga vel sublanceolata circ. 2.5 cm. lata obtusa mucronata, margine plana, basi inaequalis obtusa; supra glabrescens; infra fulva tomentosa indumento bistrato, strato supero demum detersili; petiolus circ. 1 cm. longus indumento tenui indutus glabrescens. Flores 5–6 in umbellam dispositi; bracteae extimae caudatae, interiores rotundatae apiculatae sericeae; bracteolae ad 9 mm. longae pedicellis breviores; pedicelli ad 1.8 cm. longi sparsim floccosi. Calyx cupularis ad 2.5 mm. longus 5-lobus; lobi carnei sparsim floccosi et ciliati. Corolla laete kermesino-rosea sine maculis circ. 3 cm. longa campanulata intus extusque glabra, 5-loba; lobi rotundati. Stamina inaequalia corolla breviora; filamenta glabra. Discus glaber. Gynaeceum corollam subaequans staminibus longius; ovarium conoideum truncatum circ. 5.5 mm. longum, dense tomentosum indumenti pilis fasciatis longis; stylus glaber.

under stratum of rosette-hairs with few broad short thin-walled vesicular branches persistent beneath the upper stratum, the midrib thinly clad with hairs ; petiole about 1 cm. long more or less stout wrinkled with an indumentum like the young stems and more or less glabrescent. Inflorescence an umbel 5–6 flowered, the rhachis clad with rufous floccose greasy hairs ; flower-bud large globose ; outermost bracts like outermost scale-leaves of foliage-bud, intermediate broad rounded with short apiculus and sericeous outside and inside as much as 1.5 cm. long 1.3 cm. broad shortly fringed, innermost bracts sericeous on both surfaces oblong-elliptic cucullate mucronate ; bracteoles linear about 9 mm. long shorter than pedicels pilose from base ; pedicels as much as 1.8 cm. long often less, sparingly floccose, the hairs rufous greasy. Calyx conspicuous red cupular fleshy about 2.5 mm. long 5-lobed ; lobes rounded about half length of calyx floccose on back and margin. Corolla bright crimson-rose without spots or blotch about 3 cm. long campanulate glabrous outside and inside 5-lobed ; lobes rounded somewhat crenulate about 1.7 cm. long 2.2 cm. broad. Stames 10 unequal shorter than corolla ; filaments widened to base glabrous. Disk glabrous. Gynaeceum about same length as corolla, longer than stamens ; ovary about 5.5 mm. long conoid truncate grooved densely tomentose with long ascending fasciate much-branched hairs ; style glabrous forming a flat expanded lip below the discoid prominently lobed stigma.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 27° 40′ N. Alt. 10,000 ft. In open forests. Shrub of 4–7 ft. Flowers bright crimson rose without markings. G. Forrest. No. 14,195. July 1917.

This species resembles in its vegetative form *Rh. levistratum*, Balf. f. et Forrest (see p. 88), especially in the shape of the leaves, but it is a very distinct species. The conspicuous marks which distinguish it are : the absence of glands, the thin floccose indumentum of the young shoots and leaf-petioles, the rapid decortication of the branches, the crimson inner scale-leaves of the foliage-bud, the bistrate buff-coloured indumentum of which the upper stratum of long-stalked branched hairs forms a loose canopy to the lower of rosette-hairs and falls away often in older leaves, the few-flowered umbel, the pedicels sparingly floccose, the calyx with conspicuous red fleshy lobes, the glabrous corolla staminal filaments disk and style, the tomentose ovary.

It is one of a series of Rhododendrons that stands somewhere between the Lacteum series and the Roxieanum series, the precise limits of which we cannot define as yet. Its indumentum of the under-leaf surface is more complex than that of the Lacteum series, being bistrate, with the upper stratum more or less tomen-

tose, but not reaching the densely tomentose character met with in that of the Roxieanum series.

c829

Rhododendron Baileyi,* Balf. f.†

Branchlets a year old stout as much as 6 mm. in diameter densely lepidote with cinnamon-coloured scales bearing leaves at intervals throughout not clustered at top which are green above and chestnut-brown below coated with pale brown peltate discontiguous scales. Foliage-bud small with few (about 6) scale-leaves which persist for a time on the young shoot, outer ones oblong, all densely lepidote and ciliate; young foliage-leaves in bud convolute without marginal hairs. Leaves as much as 8.5 cm. long petiolate; lamina leathery oblong-oval as much as 7 cm. long 3 cm. broad, obtuse, terminated by a prominent apicular hydathodal mucro tinted red often 1 mm. long, margin entire not recurved, base obtuse; upper surface dark green glossy more or less coated with a bronze scurf of peltate withered scales most abundant along the grooved midrib, primary veins about 9 on each side of midrib faintly depressed giving the convex surface of the lamina a slightly undulate appearance; under surface pale buff-coloured with prominent midrib and somewhat partially prominent primary veins, punctulate-lepidote all over the green epidermal surface, scales of the persistent indumentum with a broad umbo and equally broad fringe, the radiating cells of the fringe projecting as rounded teeth, a few scales larger and infiltrated with brown secretion, the rest for the most part uncoloured; petiole straight in the plane of the lamina grooved above, all over lepidote like leaf under-surface about 1.5 cm. long. Inflorescence racemose 16-flowered, rhachis pale green

* Named after its discoverer.

† *Rhododendron Baileyi*, Balf. f.—Frutex. Rami subcrassi dense cinnamomeo-lepidoti. Folia petiolata ad 8.5 cm. longa; lamina coriacea oblongo-ovalis circ. 7 cm. longa 3 cm. lata obtusa mucronata, margine plana, basi obtusa; supra olivacea subnitida squamarum peltatarum vestigiis dense vestita; infra pallide fulva, costa media prominula, ubique punctulato-lepidota, indumenti persistentis squamis biformibus minoribus vix coloratis majoribus paucis conspersis cinnamomeo-tinctis; petiolus cinnamomeo-lepidotus circ. 1.5 cm. longus. Inflorescentia racemosa circ. 16-flora, rhachi verruculosa circ. 2.5 cm. longa; bracteae fertiles mox deciduae; bracteolae latae circ. 7 mm. longae lepidotae et pilosae; pedicelli erecti circ. 3.5 cm. longi squamis peltatis albido-verruculosi. Calyx cupularis 5-lobus dense imbricatim lepidotus; cupula circ. 1 mm. longa; lobi inaequales ad 2 mm. longi rotundati. Corolla subrotata subcarnea rubro-purpurea postice maculata circ. 1.6 cm. longa; tubus 5 mm. longus 4 mm. diam. extus lepidotus; lobi 5 rotundati circ. 9 mm. longi extus lepidoti costa media conspicua. Stamina 10 subaequalia alterna paullo breviora, tubo corollae longiora; filamenta supra basim nudam villosa. **Discus paullo puberulus. Gynaeceum circ. 7 mm. longum staminibus brevius; ovarium pallide viride circ. 2 mm. longum squamis translucentibus imbricatim vestitum; stylus crassus rubro-purpureus declinatus clavatus circ. 5 mm. longus.**

wartily lepidote about 2.5 cm. long, lowermost flowers expanding last; fertile bracts soon deciduous ovate acute cucullate about 1.1 cm. long, 7 mm. broad more or less membranous lepidote and hairy outside, adpressed-hairy specially towards top inside, apiculate, the apiculus somewhat hair-crested, ciliate with many short and fewer long more or less woolly hairs; bracteoles broad soon deciduous oblong about 7 mm. long 2.5 mm. broad cucullate obtuse lepidote and hairy like the bracts; pedicels erect stiff slightly nodding at the top which is not expanded and is set in the middle of the calyx, about 3.5 cm. long 1.5 mm. in diameter, pale green at the base, bright red upwards, wartily discontiguously lepidote with yellowish translucent scales showing a broad fringe. Calyx shallow cup-shaped densely covered with imbricate scurfy yellowish scales; cup about 1 mm. long 5-lobed; lobes unequal, sometimes one as much as 2 mm. long the others much less, the majority small, all rounded, the large with an occasional long marginal hair. Corolla slightly fleshy about 1.6 cm. long somewhat rotate deep red-purple with darker symmetrically disposed spots on the three posterior lobes; tube wide about 5 mm. long 4 mm. in diameter, outside lepidote with yellow scales more on the posterior side, inside glabrous or slightly hairy shining paler at the throat; lobes 5 rounded about 9 mm. long and broad with a conspicuous midrib, sparingly lepidote on back. Stamens 10 subequal exceeding the corolla-tube, alternate ones slightly shorter, longest about 1 cm. long; filaments stout red-purple, hairy above the naked base which is about 1.5 mm. long, in four posterior stamens densely hairy to 1.5 mm. from anther, in others the hairs form an annular tuft near the base; anthers brown large 3 mm. long, 1.5 mm. broad. Disk dark green slightly puberulous below the ovary. Gynaeceum about 7 mm. long shorter than stamens; ovary pale green broadly conoid truncate-retuse about 2 mm. long, 3 mm. in diameter completely covered with white translucent imbricate scales; style stout red-purple declinate about 5 mm. long, clavate and forming a lip under the like-coloured flat lobulate stigma.

S. Tibet. Upper Nyamjang Valley. About Lat. 28° N., Long. 92° E. Alt. 10,000–14,000 ft. Capt. F. M. Bailey. No. 5. Beginning of November 1913.

Captain (now Lieut.-Col.) F. M. Bailey, in course of his journey in the year 1913, when investigating the course of the Tsangpo river, gathered seeds of several species of Rhododendron, and these he generously presented to the Royal Botanic Garden, whence a distribution to other gardens was made. Plants have been raised from the seeds at Edinburgh and elsewhere. As yet only one, so far as I know, has flowered—the species described here as *Rh. Baileyi*. We received a truss of it from Mr J. C.

Williams of Caerhays Castle, with whom at Werrington Park it flowered in spring of 1918.

Rh. Baileyi is a plant of considerable botanical interest. It belongs to the Lepidotum series by the whole form and construction of its flower, but it introduces us to a divergence from the well-recognised type of this series both in its foliage and inflorescence. The foliage one would not at sight suppose to belong to an ally of *Rh. lepidotum*—the blades of the leaves are so much larger; and then the inflorescence is a many-flowered raceme—its axis is as much as 2.5 cm. long. Of this latter character we have a foreshadowing in the new Bhutan species *Rh. thyodocum*, Balf. f. et Cooper (see p. 148); but there 8 flowers are apparently a maximum in the raceme, and its axis does not exceed 1 cm. in length.

The Lepidotum series belongs to a section of Rhododendron to which Maximowicz gave the name Osmothamnus, a name which conveys about the only character which attaches to all the species that have been included in the section—they are aromatic shrubs. The Lepidotum series is a distinct phylum, and its marks are: Twiggy aromatic shrubs, lepidote all over stems and leaves flower-pedicels calyx and outside of corolla. Foliage-leaves convolute, before expanding, ciliate with deciduous marginal hairs. Flowers terminal solitary or in groups of 2 to 16 umbellately or racemosely arranged. Pedicels long pushing flowers above the leaves, at first at least, thickening and elongating in fruit. Calyx-lobes lepidote fairly developed. Corolla rotate flat; limb as much as 3 cm. across vertical when expanded; lobes more or less rounded auricled imbricate yellow or rose-purple spotted green orange or purple; tube cup-shaped short not bearded. Stamens 8–10 exserted shorter than corolla; filaments villous above base and within corolla-tube. Ovary short truncate sulcate and lepidote; style equalling or slightly longer than ovary shorter than stamens clavate deflexed purple in purple flowers, yellow-white in yellow flowers; stigma in middle of summit of style, lobulate. Capsule (where known) oblong or elliptic or conoid short not over 6 mm. long, dehiscing by 5 valves from apex to base which is invested by persistent calyx.

We know seven species in the series :—

Rh. Baileyi, Balf. f. (1919).	S. Tibet: Upper Nyamjang Valley, 10,000–14,000 ft. (Bailey).
Rh. elaeagnoides, Hook. f. (1849).	Sikkim, 12,000–16,000 ft. (Hooker); Bhutan, 13,000 – 14,000 ft. (Cooper).
Rh. lepidotum, Wall. (1834).	Nepal (Wallich): Sikkim, 12,000–15,000 ft. (Hooker); N.W. Himalaya, 10,000–14,000 ft.; Bhutan, 11,000–14,000 ft. (Cooper).

Rh. obovatum, Hook. f. (1849).	Sikkim, 12,000 ft. (Hooker).
Rh. salignum, Hook. f. (1849).	Sikkim, 7000 ft. (Hooker) ; Bhutan, 8000 ft. (Cooper).
Rh. sinolepidotum, Balf. f. (1917).	Yunnan (Delavay) ; E.N.-W.-Yunnan : Likiang Range, 9000–12,000 ft. (Forrest) ; Langkiung, 8000–9000 ft. (Forrest).
Rh. thyodocum, Balf. f. et Cooper (1919).	Bhutan, 12,000–14,000 ft. (Cooper).

All of them, excepting perhaps *Rh. thyodocum*, are in cultivation.

A critical account of these species must be reserved for another occasion. As matter of fact, there are points in the life-history of some of them which require further examination in the living plants. The following key for identification of the species may be useful :—

1. Leaves small, under 1 cm. long and broad. Flowers in 1–3-flowered umbels.
   A. Leaves obovate.
      (*a*) Corolla yellow, orange-spotted ; lobes rounded, 3-nerved . . . ***elaeagnoides.***
2. Leaves medium, over 1.5 cm. long, under 1 cm. broad. Flowers in 1–3-flowered umbels.
   B. Leaves oblong or elliptic-oblong, about twice as long as broad.
      (*b*) Corolla rose-purple, red-spotted ; lobes rounded, lateral veins deliquescing from base of lobes or near it . *sinolepidotum.*
   C. Leaves lanceolate, thrice as long as broad.
      (*c*) Corolla whitish-yellow, green-spotted ; lobes pointed, 3-nerved . . ***salignum.***
      (*d*) Corolla rose-purple, dark-spotted; lobes rounded, 3-nerved . . . ***lepidotum.***
3. Leaves large, over 2 cm. long, over 1 cm. broad. Flowers umbellate or racemose.
   D. Leaves obovate, under 4 cm. long under 2 cm. broad, twice as long as broad.
      (*e*) Umbels 1–3-flowered. Corolla rose-purple, dark-spotted ; lobes rounded, 3-nerved . . . . ***obovatum.***
      (*f*) Flowers in a racemose truss up to 8-flowered. Corolla purple, dark-spotted ; lobes rounded, lateral veins deliquescing from base or near it . *thyodocum.*
   E. Leaves oblong-oval up to 8.5 cm. long, 3 cm. broad.
      (*g*) Flowers in many-flowered (16) racemes. Corolla deep red-purple, darker-spotted ; lobes rounded, lateral veins deliquescing from base or near it . *Baileyi.*

U820

Rhododendron bathyphyllum,* Balf. f. et Forrest.†

Shrub a little over 1 m. high with stout branches about 5 mm. in diameter when a year old, densely tomentose with a thick rust-coloured indumentum which persists more or less, becoming dirty grey on the older parts of branches, the scale-leaves of the foliage-bud not persisting after the first year, the foliage-leaves persisting for several years. Foliage-bud large globose; outer scale-leaves crustaceous large rotundate carinate more or less apiculate and slightly puberulous outside but rufously tomentose around the apiculus, ciliate; inner scale-leaves membranous yellow with tints of brown obovate or oblong-spathulate obtuse or rounded and mucronulate, inside more or less hairy with simple and branched hairs, outside silkily hairy and glandular above the middle, glands ovoid red shortly stalked, densely tomentose and glandular on the mucro, ciliate; young foliage-leaves revolute, upper surface densely clad with caducous white hairs of 3–5 pointed branches proceeding from a common base. Leaves petiolate about 8 cm. long; lamina very thick and leathery oblong as much as 7 cm. long 2.5 cm. broad obtuse, tip recurved and the small tuberculate mucro hidden in a downwardly turned apical depression, margin revolute, base obtuse or rounded, with the lobes imbricate over the petiole; upper surface mat green slightly rugulose and shagreened (when dry), glabrescent but more or less showing the remains of juvenile fallen hairs and also glands particularly on the midrib and primary veins, midrib grooved, primary veins as many as 14 on each side faintly grooved; under surface densely brightly ferruginously tomentose, the very broad midrib showing at the

* *βαθύφυλλος*, leafy—in allusion to the density of the foliage.

† *Rhododendron bathyphyllum*, Balf. f. et Forrest.—Frutex nanus ramis crassis dense rufo-tomentosis demum cinerascentibus. Alabastra globosa magna; perulae exteriores crustaceae rotundatae apiculatae, interiores obovatae vel oblongo-spathulatae membranaceae flavidae extus tomentosae et glandulosae; folia juvenilia revoluta supra pilis caducis vestita. Folia petiolata ad 8 cm. longa; lamina crasse coriacea oblonga ad 7 cm. longa, 2.5 cm. lata, obtusa apice revoluta, margine revoluta, basi obtusa vel rotundata; supra rugulosa costa media venisque primariis (ad 14) sulcatis, pilorum et glandularum juvenilium vestigiis notata, plus minusve glabrescens; infra laete ferruginea densissime tomentosa costa media sub indumento elevata, indumenti pilis biformibus; petiolus crassus ad 1 cm. longus dense tomentosus. Umbella ad 8-flora; bracteae sub anthesi plus minusve persistentes, intimae tomentosae; bracteolae filiformes pedicellos subaequantes; pedicelli ad 1.4 cm. longi floccoso-pubescentes saepe subglabrescentes. Calyx ad 6 mm. longus 5-lobus; cupula circ. 1 mm. longa; lobi inaequales, posteriores maximi lanceolati acuminati ad 5 mm. longi, anteriores vix 1 mm. longi. Corolla alba kermesino-maculata obliqua circ. 4 cm. longa 5-loba; lobi subaequales. Stamina 10 inaequalia corolla breviora; filamenta pubescentia. Discus puberulus. Gynaeceum circ. 2 cm. longum staminibus longius; ovarium circ. 3 mm. longum dense tomentosum eglandulosum; stylus glaber.

base through the thick tomentum, tomentum persistent biform, of long hairs with a rhachis two or three cells thick branching freely—the branches vesicular thin-walled curling and interweaving—mixed with hairs likewise curling but without the strong shaft of the long hairs ; petiole stout about 1 cm. long 3.5 mm. in diameter grooved above, completely enwrapped in the thick ferruginous indumentum. Flowers in a terminal about 12-flowered umbel ; bracts persistent more or less during flowering shaped like the scale-leaves of foliage-bud only larger, inner ones densely silkily tomentose on both sides ; bracteoles filiform as long as or longer than pedicels pilose from the base ; pedicels at most 1.4 cm. long more or less floccose but glabrescent often showing only a few hairs, eglandular. Calyx with a dark red fleshy cup bearing 5 unequal lobes ; posterior lobes lanceolate acuminate about 5 mm. long, antero-lateral deltoid short about 1.5 mm. long, all glabrous but with red floccose cilia on the margins. Corolla campanulate thin markedly oblique white with many crimson spots over the posterior side about 4 cm. long slightly 5-gibbous glabrous inside and outside with faint imperfect basal interpetaline septa inside, 5-lobed (sometimes 6-lobed) ; lobes rounded emarginate crenulate posterior largest about 1.2 cm. long and 1.8 cm. broad, other lobes narrower. Stamens 10 unequal shorter than corolla, longest about 1.9 cm. long with brown anther about 2 mm. long, shortest about 1.5 cm. long with anther about 1.5 mm. long ; filaments widened downwards, at the very base naked or almost so over about 1 mm. then pubescent with longish hairs upwards to middle, or beyond it in shorter stamens. Disk green finely puberulous below ovary. Gynaeceum about 2 cm. long about equal to or only slightly exceeding the longest stamens ; ovary about 3 mm. long conoid truncate grooved completely covered by a pinkish tomentose indumentum of stiff single or fasciately-branched pointed hairs with thick walls, eglandular, sometimes becoming bare of hairs towards the top ; style reddened glabrous hardly widened beneath the medium-sized discoid lobulate lipped stigma.

S.E. Tibet. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 30′ N. Alt. 13,000 ft. On rocky slopes. Shrub of 4–5 ft. Flowers white with copious crimson markings. G. Forrest. No. 14,718. Aug. 1917.

This plant looks like one of the Roxieanum series trying to become something else. The bright rusty-coloured tomentum on the under surface of the narrow oblong recurved leaves suggests the Roxieanum series, but the stems are not covered by the persistent scale-leaves of the foliage-buds, nor are the leaves densely aggregated on short annual growths as is usual in the series. The hairs of its indumentum of the under-leaf surface

resemble those of *Rh. comisteum*, Balf. f. et Forrest, which is placed in the Roxieanum series, although the hairs are not quite those of the type of the series. Then its glandular inner scale-leaves, long bracteoles, dense terminal inflorescence, white corolla with crimson markings, puberulous stamens, tomentose ovary and glabrous style are all characters found more or less in the Roxieanum series, but its calyx is different, as is the oblique corolla. It is not quite the Roxieanum type as exhibited by *Rh. Roxieanum*, Forrest et W. W. Sm., *Rh. recurvum*, Balf. f. et Forrest, and *Rh. proteoides*, Balf. f. et W. W. Sm., but is on the fringe of that series.

Forrest has recently tapped a region in which there is a great development of species which are extremely alike in flower-character but in foliage show slight variation in form along with marked difference in construction of indumentum, although to casual observation the similarity is great. At one extreme are forms like *Rh. lacteum*, Franch. and *Rh. Traillianum*, Forrest et W. W. Sm., with their unistrate suède-surfaced indumentum, and at the other species like those of the Roxieanum series, with a well-developed bistrate woolly tomentum. Between come forms grading to each extreme, the elucidation of which is far from being accomplished as yet, though several of the species are described in these pages. *Rh. bathyphyllum* is one of them.

Rhododendron calvescens,* Balf. f. et Forrest.†

Shrub 1–2 m. high with few medium-thick branches. Branchlets of the year completely enclosed in a pale-coloured detersile tomentum of floccose hairs mixed with an under-stratum of red ovoid shortly-stalked glands very soon shed, branchlets a year old naked or nearly so slightly red not glossy, older branches grey and soon decorticating. Foliage-bud unknown; young unfolding leaves revolute, on both surfaces

* *calvescens*, becoming bald—in allusion to the rapid disappearance of the hairs and glands which cover the juvenile parts.

† *Rhododendron calvescens*, Balf. f. et Forrest.—Frutex ad 2 m. altus ramis juvenilibus dense floccosis et rubro-glandulosis, senioribus glabrescentibus. Folia petiolata ad 10 cm. longa; lamina coriacea oblongo-ovalis ad 3 cm. lata apiculata, margine paullo revoluta, basi truncatula vel cordulata; supra opaca glabrescens pilorum glandularumque vestigiis plus minusve notata; infra rufo-brunnea indumento detersili e glandulis rubris et floccis longis agglutinatis conspersis floccisque brevioribus composito induta, costa media pallide roseo-tincta prominula; petiolus glabrescens. Inflorescentia circ. 8-flora racemoso-umbellata; pedicelli ad 1.3 cm. longi glandulosi et floccosi. Calyx parvus succulentus glandulosus; lobi rotundati vix ·5 mm. longi glanduloso-fimbriati. Corolla campanulata circ. 3.5 cm. longa intus puberula extus glabra 5-loba; lobi rotundati circ. 1.8 cm. diam. Stamina 10 inaequalia corolla breviora; filamenta a basi ad ovarii verticem puberula. Discus glaber. Gynaeceum corollam subaequans; ovarium conoideum truncatum circ. 7 mm. longum floccosum et glandulosum; stylus glaber sub stigmate lobulato in discum expansus.

pubescent with floccose hairs fewer on upper surface mixed with red glands, more on lower, the hairs long with pluricellular stipe much branched interwoven particularly on lower surface. Leaves petiolate as much as 10 cm. long ; lamina of parchment-consistence oblong-oval as much as 9 cm. long, 3 cm. broad, obtuse with a prominent apiculus ending in a red hydathodal tubercle, margin cartilaginous slightly recurved, base trunculate or cordulate occasionally rounded only ; upper surface olive-green mat shagreened (when dry) glabrous but for traces of juvenile hairs and of withered ones in the groove of the midrib, primary veins about 12 on each side hardly visible ; under surface paler with prominent pink-tinted midrib and slightly raised reddish primary veins, the midrib bearing a few short red glands, rest of the surface coated with a thin rufescent detersile indumentum, the long-branched juvenile hairs now infiltrated with red secretion and agglutinated in small rufous tufts, the intervals between occupied by shorter floccose hairs and many short red ovoid glands ; petiole about 1 cm. long stout wrinkled glabrescent with traces of floccose hairs and red glands. Flowers about 8 in a short racemose umbel, rhachis floccose about 5 mm. long ; bracts and bracteoles unknown ; pedicels about 1.3 cm. long expanding into an oblique anthopode, elongating in fruit, strict pale green glandular with long-stalked red ovoid glands mixed sometimes with floccose red greasy hairs especially at top and bottom. Calyx small cupular 5-lobed fleshy about 1 mm. long glandular with red shortly-stalked glands ; lobes rounded red-gland-fringed. Corolla campanulate rose without blotch or spots about 3.5 cm. long puberulous inside, glabrous outside 5-lobed ; lobes rounded about 1.8 cm. broad and long emarginate. Stamens 10 unequal shorter than corolla, longer about 2.5 cm. long with anther 2 mm. long, shorter 1.2 cm. long with anther 1.5 mm. long ; filaments slightly widened downwards, from the base upwards puberulous, in shorter stamens to about middle. Disk glabrous. Gynaeceum longer than stamens about same length as corolla ; ovary conoid truncate about 7 mm. long grooved clad with rufous long setulose ascending hairs mixed with short-stalked stout orange-coloured or red glands ; style stout glabrous expanded at top into a disk forming a lip to the lobulate discoid stigma. Capsule oblique to pedicel slightly curved about 2 cm. long 5 mm. in diameter black or dark brown somewhat scabrid, splitting by 5 valves from apex leaving a narrow stylopod, style persistent in fruit, calyx a fleshy basal ring ; seeds pale chestnut-brown scimitar-shaped about 2.25 mm. long .75 mm. across, testa striate not winged, chalazal end apiculate funicular with a fringed aril.

S.E. Tibet. Tsarong. On Doker-la, Mekong-Salween divide.

Lat. 28° 20′ N. Alt. 11,000 ft. In open thickets. Shrub of 4–6 ft. Flowers rose without markings. G. Forrest. No. 14,331. July 1917; in fruit. No. 14,775. Sept. 1917.

A species clearly marked by the indumentum of the leaf underside. The surface appears to be dotted all over at intervals with little rufous-brown tufts of tomentum standing up from a uniform rufous-brown surface, whilst some places are bare of them and show a mat-green epidermal surface. From these bare places the tufts have fallen, and also more or less the shorter floccose rufous-brown hairs which give the uniform tint to the whole leaf under surface. The indumentum may in this adult state be spoken of as biform and bistrate, and it is developed in the following way. The young unfolding leaf has the whole under-leaf surface, enwrapped as it is by the revolute laminar halves, clad closely but not densely with whitish hairs of a distinctive kind. They have long many-celled stalks, the cells of the stalks much elongated, and then they branch, producing always two or three cylindric unicellular stoutish branches at each branching; the branches ascend and slightly diverge, and then again branch in like manner, and their progeny branch, so that a long-branched hair is formed. Some hairs have their branching apparently restricted, and are therefore shorter. Mixed with the hairs are many greasy red short-stalked ovoid glands. Very soon after unfolding of the leaf the contents of these hairs long and short become red and the hairs look greasy, then the long branching hairs become agglutinated in groups and dry up to form the little rufous-brown tufts, the other shorter hairs between forming the general surface covering. In some old leaves the whole indumentum may have been removed, leaving the mat-green epidermal surface which often becomes a pale brown colour.

The plant with its trunculate or cordulate oblong-oval apiculate leaves, glandular pedicels, floccose and glandular ovary with glabrous style, seems to have affinity with those species which I have brought together in the series Selense,* and I have little doubt about their relationship. The development of the under-leaf indumentum is, however, much greater than in other species of the series, where cauliflower glands and few shortly-branched floccose hairs are its maximum development. The series is apparently a prominent type on the Mekong-Salween divide in the extreme N.W. of Yunnan and in the Tsarong, the adjacent region of S.E. Tibet.

* See Notes, R.B.G., Edin., x (1917), 97.

Rhododendron cheilanthum,* Balf. f. et Forrest.†

Woody shrub about 1 m. high much branched with ascending branches, annual increments short. Branches a year old about 2 mm. in diameter furfuraceously lepidote with crowded brown stalked peltate concave scales which become warts (either entire or the stalks only) on the older grey branchlets. Foliage-buds oblong-ovoid; outermost scale-leaves thick elongate-triangular or oblong acute about 4 mm. long furfuraceously brown-lepidote outside, sericeous and lepidote inside, setulose-ciliate; intermediate 4 mm. pergamentaceous broadly ovate or rounded apiculate slightly keeled straw-coloured lepidote and puberulous outside, sericeous at top inside, ciliate; innermost oblong or obcuneate truncate apiculate cucullate about 5.5 mm. long 2.5 mm. broad lepidote and puberulous on back, sericeous at top inside, pectinately setulose-ciliate; young foliage-leaves densely white-lepidote on both sides with some hairs on midrib above and on margin at base; petiole grooved and puberulous and with a few marginal setulose hairs. Leaves petiolate as much as 2.5 cm. long; lamina thickly leathery oblong-oval or oval or oboval as much as 2.2 cm. long and 1 cm. broad usually less, apex rounded shortly mucronulate the tuberculate mucro usually recurved, margin slightly recurved roughened sometimes ciliate at base, base cuneate; upper surface opaque dark-green but with a greyish surface from many withered discontiguous though close-set peltate uniform scales, the umbo of the scales broad

* *χεῖλος*, a lip—in allusion to the flower-shape.

† *Rhododendron cheilanthum*, Balf. f. et Forrest.—Frutex lignosus ad 1 m. altus multo ramosus. Rami annotini circ. 2 mm. diam. squamis brunneis stipitatis uniformibus furfuracei, vetustiores verruculosi. Alabastrorum perulae extimae elongato-triangulares brunneo-furfuraceae setuloso-ciliatae, intimae oblongae vel obcuneatae apiculatae extus lepidotae et puberulae setuloso-ciliatae; folia juvenilia supra ad costam mediam plus minusve puberula margine basim versus ciliata. Folia petiolata ad 2.5 cm. longa; lamina crasse coriacea oblongo-ovalis vel ovalis vel obovalis ad 2.2 cm. longa 1 cm. lata apice rotundata breviter mucronulata mucrone decurvato, margine asperulata, basi cuneata; supra opaca atroviridis squamis discontiguis siccis albidis uniformibus grisea; infra pallide fulva nitens squamis contiguis uniformibus concoloribus vestita, costa media elevata; petiolus circ. 2 mm. longus sulcatus sulco puberulo. Flores in umbellas 3–6-floras solitarias terminales dispositi; bracteae sub anthesi persistentes; bracteolae claviformes pedicellis longiores; pedicelli circ. 6 mm. longi dense lepidoti. Calyx cupularis circ. 5 mm. longus 5-partitus; cupula lepidota; lobi membranacei virides vel rosei oblongi vel oblongo-ovales circ. 4 mm. longi extus lepidoti et puberuli. Corolla rosea zygomorpha vix 2 cm. longa extus epilosa lepidota; tubus circ. 6 mm. longus; lobi postici longiores circ. 6 mm. longi 8 mm. lati. Stamina 10 inaequalia corollam subaequantia alternatim longiora et breviora; filamenta puberula. Discus puberulus. Gynaeceum corollam staminaque subaequans; ovarium circ. 1.5 mm. longum ovoideum truncatum lepidotum epilosum; stylus basi puberulus. Capsula oblongo-ovoidea circ. 9 mm. longa 4 mm. lata pallide brunnea lepidota calyce plus minusve inclusa ab apice ad medium valvis 5 dehiscens. Semina complanata oblonga circ. 1 mm. longa exalata et exarillata.

usually infiltrated with pale yellow secretion not scintillating, the fringe translucent equally broad, interval between the scales less than diameter of scales, midrib grooved lined at base with a few short hairs ; under surface pale buff-coloured smooth somewhat shining lepidote with contiguous uniform concolorous stalked peltate scales, the stalks sunk in pits the umbo broad with an annulus of orange-coloured secretion and a broader white translucent fringe, on old leaves some scales occasionally become dark-brown giving the surface an obscurely punctulate aspect, epidermis between the scales covered with conoid truncate striate papillae, midrib prominent less lepidote and with scales many of them darker tinted ; petiole as much as 2 mm. long lepidote grooved above and with a few hairs in the groove. Flowers in 3–6-flowered solitary terminal umbels ; bracts more or less persistent during flowering, outer chartaceous with thinner margin, broadly ovate or rounded keeled mucronulate silky inside and outside, densely whitely lepidote on back, slightly brown-purple tinted, white-ciliate, inner bracts obovate-spathulate about 7.5 mm. long 5 mm. broad membranous truncate or retuse whitely ciliate hairs almost woolly along summit, silky on both surfaces and lepidote on back ; bracteoles clavate dark-brown membranous 7.5 mm. long longer than pedicels, ciliate, on the back above lepidote with a few scales, white hair-crested ; pedicels as much as 6 mm. long densely lepidote with large white seal-like peltate discontiguous scales, pale green or pink-tinted. Calyx cupular about 5 mm. long 5-partite, cup as much as 1 mm. long densely lepidote with white membranous overlapping scales ; lobes thin pale membranous at margin, greenish or yellowish or tinted pink along the middle oblong or oblong-oval about 4 mm. long 1.5 mm. broad, posterior sometimes a little longer than anterior, obtuse or rounded at apex densely and whitely lepidote with large scales along middle of back and there puberulous at the sides, inside faintly puberulous at base, margin and apex fringed and woolly-ciliate. Corolla deep rose-colour slightly zygomorphous under 2 cm. long, epilose outside and lepidote ; tube slightly widening upwards about 6 mm. long slightly puberulous inside expanding into an openly funnel-shaped somewhat unequally 5-lobed limb more erect on the posterior side spreading anteriorly ; lobes more or less oval or subelliptic slightly crenulate, posterior ones about 6 mm. long 8 mm. broad, anterior longer and narrower, on the middle of the outer surface clad with large peltate scales. Stamens 10 about equal in length to corolla alternately long and short, longer about 2 cm. long with ovoid anther pale ochre-coloured about 1 mm. long, shorter about 1.3 cm. long ; filaments slightly expanded downwards, naked at the base over 2 mm., puberulous

upwards through sometimes as much as one-third the length. Disk puberulous on ridges. Gynaeceum under 2 cm. long about equalling corolla and stamens ; ovary about 1.5 mm. long ovoid truncate grooved lepidote with translucent yellowish imbricate peltate scales epilose ; style tinted pink sparsely puberulous at the base slightly expanded under the discoid lobulate lipped stigma. Capsule pale brown densely lepidote oblong-ovoid as much as 9 mm. long and 4 mm. in diameter enclosed in lower half by the persistent calyx, dehiscing from apex to about middle by 5 valves. Seeds flattened oblong about 1 mm. long bright brown, integument striate, without wings or chalazal or funicular arils.

E.N.-W.-Yunnan. Mountains in the N.E. of the Yangtze bend. Open scrub. Lat. 27° 45′ N. Alt. 10,000–11,000 ft. Shrub of 3–4 ft. Flowers deep rose. G. Forrest. No. 10,435, July 1913 ; in open situations amongst scrub. Alt. 11,000 ft. In fruit. G. Forrest. No. 11,736. Oct. 1913.

From seed collected by Forrest in 1913 under No. 11,736 seedlings have been raised but have not yet flowered.

This Forrestian plant belongs to that set of the Lapponicum series in which the under-leaf indumentum is composed of large uniform scales contiguous and concolorous giving a pale buff or tawny surface to the leaf. Of species showing the character *Rh. cuneatum,* W. W. Sm. is its nearest ally. The forms of that species have yet to be worked out. Its type was collected by Forrest on the eastern flank of the Likiang Range and later gatherings seem to show that the plant is somewhat variable. As a species *Rh. cheilanthum* can be readily diagnosed from *Rh. cuneatum* by the broad rounded apex of the smaller leaves bearing a small tuberculate mucro which is usually deflexed and hidden under the lamina, by the much brighter sheen of the indumentum and by the much smaller flowers—the corolla being under 2 cm. long whilst that of *Rh. cuneatum* is about 3 cm. long. The style in *Rh. cheilanthum* is also only about the length of the corolla and not as in *Rh. cuneatum* much longer than the corolla. The style in both is puberulous at the base. I was wrong in speaking of the glabrous style of *Rh. cuneatum* in a previous paper.* In the young leaves there is a difference. Whilst in *Rh. cuneatum* they are epilose in *Rh. cheilanthum* there are some hairs on the upper midrib and groove of the petiole and on the leaf-margin at the base. These marginal hairs may persist for a time and the newly unfolded leaves may therefore be ciliate at the base.

* Notes, R.B.G., Edin., ix (1916), 312.

Rhododendron citriniflorum, Balf. f. et Forrest.*

Dwarf shrub about 1 m. high with many straight branches at first about 3 mm. in diameter and tomentose with branched interlocking closely adpressed hairs, annual growths short, each growth about 2.5 cm. long producing some 3–4 leaves rosette-fashion at the top which persist for 2–3 years and when they fall leave a nodular swelling on the stem marking top of the annual growth, bare below but girt at the base with the persistent outermost scale-leaves of the foliage-bud which remain for several years. Outermost persistent scale-leaves of the foliage-bud few (5–6), crustaceous oval or elliptic or oblong apiculate or tailed tomentose along the midrib outside, the apiculus densely clad with rufous hairs, margin floccose-ciliate; inner scale-leaves ligulate mucronulate membranous longest about 2 cm. long 4 mm. broad yellowish with long marginal cilia, rufously hairy at the mucro; young foliage-leaves revolute floccose on upper surface the hairs falling as the leaf opens. Leaves petiolate as much as 6 cm. long; lamina thickly leathery obovate or oblong-obovate as much as 5.5 cm. long 2.5 cm. broad obtuse with a rounded hydathodal red mucro, margin cartilaginous plane, base prolonged as a narrow wing upon the petiole; upper surface olive-green mat, glabrescent but with traces of the juvenile hairs particularly in groove of midrib, primary veins about 8 on each side ascending at an acute angle, ultimate veins hidden; under surface fawn-coloured, with a raised slightly pink-tinted and sparingly floccose midrib, rest of venation hidden by a dense bistrate soft not crustaceous indumentum, hairs of the upper stratum with stout bare stems branching tree-fashion into

* *Rhododendron citriniflorum,* Balf. f. et Forrest.—Frutex nanus ad 1 m. altus. Rami tenues pilis adpressis detersilibus tomentosi, ad apicem folia 3–4 rosulatim gerentes alabastrorum perulis exterioribus persistentibus vestiti. Folia petiolata ad 6 cm. longa; lamina crasse coriacea obovata vel oblongo-obovata ad 5.5 cm. longa 2.5 cm. lata obtusa mucronulata, margine plana, basi obtusa in alam angustam petiolarem prolongata; supra olivacea opaca costa media et venis primariis sulcatis venis ultimis occultis, glabrescens sed pilorum juvenilium vestigiis praecipue in sulco costae mediae notata; infra subpallide fulva indumento bistrato dense vestita, strati superi pilis subdendriformibus stipite crasso ramisque elongatis, strati inferi pilis rosulatis ramis latis brevibus vesiculosis glandulis intermixtis; petiolus circ. 5 mm. longus tomentosus glabrescens. Umbella terminalis 4–6-flora; bracteolae lineari-clavatae brunneae a basi sparsim et breviter pilosae; pedicelli ad 3 cm. longi glanduloso-setulosi floccosi et pilis rosulatis brevibus vestiti. Calyx cupularis 5-lobus circ. 3 mm. longus; cupula setuloso-glandulosa et floccosa; lobi ovati vel deltoidei vel rotundati virides extus glabri margine setuloso-glandulosi. Corolla campanulata laete citrina ad 4 cm. longa; tubus basi septis incompletis 5 ornatus extus intusque glaber; lobi 5 emarginati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta basi puberula. Discus glaber. Gynaeceum circ. 3 cm. longum corolla brevius; ovarium circ. 4 mm. longum ovoideum pilis floccosis et glandulis setulosis dense vestitum; stylus glaber.

narrow pointed branches, the branches interlocking and covering the under stratum of rosulate hairs with broader vesicular branches, eglandular—(sometimes the hairs are throughout or in part invaded by a fungus with brown-black mycelium to an extent so great as to give the whole under-leaf tomentum a black or grey-brown colour); petiole about 5 mm. long, grooved above tomentose at first, glabrescent. Flowers in a 4–6-flowered terminal true umbel; bracts unknown; bracteoles linear-clavate brown about 8 mm. long sparingly and shortly hairy; pedicels as much as 3 cm. long strict ascending expanding below the calyx woolly with a bistrate fulvous indumentum, upper stratum of long setose hairs ending each in a clavate gland mixed with hairs having a long axis and producing many short erect branches, under stratum of rosette-hairs. Calyx cupular about 3 mm. long; cup outside setulose and floccose like the pedicels; lobes 5 rounded ovate or deltoid green or coloured membranous about 1.5 mm. long equalling the cup glabrous outside margin fringed and ciliate with long setulose glands. Corolla bright lemon-yellow without blotch or spots about 4 cm. long campanulate fleshy below with 5 imperfect interpetaline septa 5-gibbous retuse glabrous outside and inside; lobes 5 semi-lunate, about 1.5 cm. long and 2.6 cm. broad emarginate crenulate. Stamens 10 unequal shorter than corolla, longest about 2.5 cm. long with dark brown anther about 2 mm. long, shortest about 1.8 cm. long with anther 1.5 mm. long; filaments pale yellow widened to base which is coloured orange, from the base finely puberulous to middle of shortest stamens. Disk glabrous dark purple-coloured. Gynaeceum about 3 cm. long shorter than corolla longer than stamens; ovary about 4 mm. long grooved ovoid truncate densely tomentose with an indumentum of floccose golden-yellow hairs and many setulose glands; style glabrous pale yellow clavate under the flat broad lobulate lipped stigma.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 13,000 ft. On rocks and cliffs. Shrub of 2 ft. Flowers soft rose without markings. G. Forrest. No. 14,271. July 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 13,000 ft. On open rocks and cliff edges. Shrub of 2–3 ft. Flowers bright lemon-yellow without markings. G. Forrest. No. 14,272. July 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 13,000 ft. On ledges of cliffs. Shrub of 3–4 ft. Flowers bright lemon-yellow without markings. G. Forrest. No. 14,274. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 13,000 ft. On rocky slopes and

cliffs. Shrub of 2–3 ft. Flowers bright lemon-yellow. G. Forrest. No. 14,356. July 1917.

A plant of the Sanguineum series and a very fine one. Its bright yellow flowers are in striking contrast to the dark blood-red flowers of *Rh. sanguineum*, Franch., and of *Rh. haemaleum*, Balf. f. et Forrest. Like *Rh. cloiophorum*, Balf. f. et Forrest, which has also yellow flowers, this species has the outer scale-leaves of the foliage-bud persisting on the nodular stems, and in *Rh. cloiophorum* finds its nearest affinity, differing from it in its possession of glandular pedicels and ovaries, setulose glandular smaller calyx, and puberulous staminal filaments. In the whole Sanguineum series *Rh. citriniflorum* is distinguished by its greater development of the upper stratum of the under-leaf indumentum. The long hairs of the stratum form a conspicuous tomentum over the rosette-hairs of the under stratum. On p. 80 will be found reference to the distinctive characters of the Sanguineum series.

1907

Rhododendron cloiophorum,* Balf. f. et Forrest.†

Dwarf shrub about 1 m. high with many straight thin somewhat nodulose branches glabrescent almost glabrous with a few traces of juvenile hairs, annual growths short about 1 cm. long or a little more producing some 4–6 foliage-leaves rosette-fashion at the top and girt at base by the persistent outermost scale-leaves of the foliage-buds which remain for several years. Foliage-bud unknown. Leaves petiolate about 5.5 cm. long; lamina leathery obovate as much as 5 cm. long 1.8 cm. broad obtuse ending in a conspicuous red hydathodal mucro, margin hardly cartilaginous nearly plane, base prolonged as a narrow wing on the petiole; upper surface olive-green opaque glab-

* *χλοιοφόρος*, wearing a collar—in allusion to the reflexed calyx around the base of the corolla.

† *Rhododendron cloiophorum*, Balf. f. et Forrest.—Frutex nanus circ. 1 m. altus multi-ramosus. Rami glabrescentes plus minusve nodulosi folia 4–6 rosulatim ad apicem gerentes. Alabastrorum perulae extimae plus minusve persistentes. Folia petiolata ad 5.5 cm. longa; lamina coriacea obovata ad 5 cm. longa 1.8 cm. lata obtusa mucronulata, margine subplana, basi in petiolum prolongata; supra olivacea opaca glabrescens pilorum vestigiis notata; subtus pallide fulva indumento bistrato eglanduloso scintillante denso haud agglutinato vestita, strati superi pilis breviter stipitatis apice divaricatim ramosis, strati inferi pilis rosulatis; petiolus ad 5 mm. longus glabrescens. Umbella 3–4-flora; pedicelli ad 1.7 cm. longi pubescentes eglandulosi. Calyx subfoliaceus ad 1.3 cm. longus; lobi inaequales flavi membranacei demum reflexo-patentes et decidui, glabri sed sparsim floccoso-ciliati. Corolla rosea tubuloso-campanulata circ. 3.7 cm. longa; tubus carneus basi septis interpetalinis incompletis divisus; lobi rotundati 1.3 cm. longi 1.6 cm. lati emarginati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta glabra. Discus glaber. Gynaeceum circ. 3 cm. longum corolla brevius; ovarium conoideum eglandulosum pilis longis floccosis dense tomentosum; stylus glaber.

rescent but with traces of juvenile hairs particularly in groove of midrib, primary veins about 8 on each side slightly ascending at an acute angle, ultimate veinlets hardly visible; under surface fawn-coloured, midrib raised slightly pink-tinted and sparsely floccose, some primary veins slightly raised, rest of venation concealed by a dense bistrate indumentum of whitish hairs forming a scintillating not crustaceous nor agglutinate but somewhat wefted honeycombed surface, hairs of upper stratum stalked the stalk pluricellular not long ending in a tuft of thin-walled elongated blunt branches, those of adjacent hairs interlocking and forming a canopy over more shortly-stalked or nearly sessile rosette-hairs with short vesicular branches, eglandular; petiole about 5 mm. long glabrescent with a few traces of juvenile hairs. Flowers in 3–4-flowered terminal umbels; bracts and bracteoles unknown; pedicel about 1.7 cm. long stout dilated under the calyx, pubescent with short floccose fasciate hairs, eglandular. Calyx conspicuous as much as 1.3 cm. long; cup short about 1 mm. long with a few floccose hairs outside, bearing 5 yellow membranous lobes deflexing and then deciduous; lobes unequal largest about 1.2 cm. long and 6 mm. broad ovate acuminate or tailed glabrous inside, outside sparingly floccose, ciliate, small lobes often 2 or 3 mm. long and broad. Corolla tubular-campanulate rose with darker margin yellowish towards base about 3.7 cm. long; tube fleshy imperfectly septate by 5 interpetaline folds 5-gibbous retuse at the base glabrous outside and inside, 5-lobed; lobes rounded about 1.3 cm. long and 1.6 cm. broad emarginate crenulate. Stamens 10 unequal much shorter than corolla, longest about 2.3 cm. long with dark purple anther about 3 mm. long, shortest about 1.2 cm. long with anther 2 mm. long; filaments pale-coloured slightly widened to base glabrous. Disk glabrous. Gynaeceum about 3 cm. long shorter than corolla longer than stamens; ovary ovoid truncate about 4 mm. long grooved eglandular densely tomentose with an indumentum of adpressed greasy rufescent floccose hairs; style stout glabrous clavate under the lobulate lipped broad stigma.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 11,000 ft. On open rocky slopes. Shrub of 4 ft. Flowers rose, darkest round margins, yellowish towards base. G. Forrest. No. 14,269. July 1917.

Another delightful species allied to *Rh. sanguineum*, Franch. It finds its closest affinity in *Rh. citriniflorum*, Balf. f. et Forrest, and recalls in many features that species, having the persistent outer scale-leaves of the bud clothing the nodular stem more or less. It is easily distinguished by its under-leaf indumentum, which is much thinner, forms a more compact

honeycombed scintillating surface, and though bistrate has not got the very long branched hairs of the upper stratum which characterise *Rh. citriniflorum* and make its indumentum so much thicker and so much looser on the surface Then the indumentum of the ovary is eglandular—there are none of the glands that occur in *Rh. citriniflorum*. In the flower the calyx supplies a most distinctive mark, for here it is larger, with membranous lobes which spread out like a collar around the base of the corolla, becoming reflexed, and as they wither often falling off. The lobes are, moreover, glabrous and have only a few short floccose hairs as a ciliary margin. All this is in marked contrast to the shorter greenish lobes of *Rh. citriniflorum*, which are setulose and glandular all over and have gland-setæ bristling along the margin. Then the staminal filaments are here glabrous, not puberulous, as in *Rh. citriniflorum*. The mention of these may suffice, but they are by no means all the diagnostic marks.

On p. 80 I have dealt with the relationships of *Rh. sanguineum* and its allies.

4795 **Rhododendron colletum,*** Balf. f. et Forrest.†

Shrub as much as 4 m. high with thick branches. Branchlets a year old pale green often enclosed at base by persistent sticky scale-leaves of foliage-bud, apparently coated with floccose red and brown hairs which soon fall off. Scale-leaves of the pyramidal foliage-bud crustaceous semi-lunate to ovate and obovate with a thinner fringed margin, dark-brown, viscid with external sessile glands and short hair-glands, inside the scale-leaves

* κολλητός, glued together—in allusion to the sticky bracts.

† *Rhododendron colletum*, Balf. f. et Forrest.—Frutex ad 4 m. altus ramis crassis. Rami annotini pallide virides alabastrorum pyramidalium perulis glutinosis plerumque cincti et pilis floccosis rufis sebaceis deciduis plus minusve vestiti. Folia petiolata ad 15.5 cm. longa; lamina coriacea oblanceolata ad 13.5 cm. vel ultra longa 5 cm. lata, subacuminata vel rostrata, margine integra, deorsum attenuata in petiolum alatum prolongata; supra opaca atro-olivacea glabra sed pilorum juvenilium vestigiis notata costa media rubro-tincta sulcata, venis primariis utrinque circ. 16–20 sulcatis; infra pallide cinereo-viridis vel pallide cinnamomea, indumento tenui unistrato scintillante facile detersili induta, indumenti pilis rosulatis breviter stipitatis vel sessilibus et breviter ramosis, costa media straminea elevata pilorum detersilium pedibus punctulata; petiolus ad 2 cm. longus crassus glabrescens. Umbella 10–12-flora bracteis viscidis sub anthesi cincta; bracteolae breves ad 8 mm. longae; pedicelli circ. 2 cm. longi sparsim floccosi. Calyx parvus fere obsoletus glaber. Corolla aperte campanulata circ. 4 cm. longa albida vel rosea basi kermesino-variculata, 5-loba; lobi lati emarginati subundulati. Stamina 10 inaequalia corolla breviora; filamenta pubescentia. Discus puberulus. Gynaeceum circ. 3 cm. longum staminibus longius, corolla brevius; ovarium circ. 5 mm. longum cylindrico-conoideum, pilis rosulatis pauci-ramosis dense vestitum, ad apicem saepe glabrum; stylus glaber. Capsula recta subverruculosa circ. 2.2 cm. longa 6 mm. diam. ab apice valvis 5 dehiscens. Semina pallide brunnea oblonga circ. 2–2.5 mm. longa, .75 mm. lata arillatim alata et ad extremitates producta.

often glued more or less together and to the base of the stem the indumentum of which as the stem elongates adheres to the glandular scale-leaves and is removed, the scale-leaves seem to fall off quite early sometimes. Leaves petiolate as much as 15.5 cm. or more long; lamina oblanceolate as much as 13.5 cm. long 5 cm. broad, acuminately narrowed at the apex into a blunt beak ending in an inconspicuous hydathode, margin entire quite flat hardly cartilaginous, narrowed from the upper third downwards to the cuneate base which is prolonged as a narrow wing along the upper edges of the petiole; upper surface opaque dark olive-green with a grooved red-tinted midrib and about 16–20 primary veins on each side also grooved, the surface lightly shagreened and glabrous but showing traces of juvenile hairs; under surface pale grey-green or pale cinnamon-coloured coated with a thin unistrate scintillating indumentum easily rubbed off of short-stalked few-armed (3 to 6) rosette-hairs, the arms short broad unicellular vesicular uncoloured or brown, the surface owing to the fall of the indumentum frequently becomes naked and in old leaves of a somewhat pale olive-green, midrib raised straw-coloured free of indumentum but punctulate with bases of fallen hairs, primary veins showing beneath the indumentum; petiole about 2 cm. long stout winged with narrow laminar wing on each side above, green or purpling, glabrescent but showing remains of juvenile flock-hairs. Flowers in a compact terminal umbel of some 10–12 flowers enclosed during flowering by the sticky bracts; outer bracts crustaceous with somewhat membranous margin, dark-brown rounded or broadly ovate coated on back with red sessile tuberculate glands, inner fertile bracts more membranous elongated as much as 3 cm. long and 8 mm. broad at top spathulate with a strap-shaped straw-coloured stalk and shorter elliptic or oval somewhat greenish blade densely pilose with sticky hairs apiculate, the apiculus hair-crested; bracteoles very short about 8 mm. long filiform pointed pilose throughout; pedicels about 2 cm. long strict red puberulous with a few flocks of reddish hairs. Calyx small saucer-shaped fleshy, margin showing 5 rounded or pointed lobes, the whole glabrous save for a few obscure marginal hairs to the lobes. Corolla openly campanulate from the base, whitish or flushed rose or pale rose with a crimson basal blotch, about 4 cm. long glabrous outside, puberulous inside, base slightly fleshy and 5-gibbous, 5-lobed; lobes broad about 1.5 cm. long and 2.2 cm. broad emarginate somewhat undulate. Stamens 10 unequal shorter than corolla, longest about 2.8 cm. long with dark-purple oblong anther about 3.25 mm. long, shortest about 1.5 cm. long with ovoid anther about 2.25 mm. long; filaments pale-coloured considerably

widened downwards, from the base upwards to above the top of the ovary puberulous with short stout pointed vesicular hairs. Disk minutely puberulous below the ovary. Gynaeceum about 3 cm. long exceeding the stamens shorter than corolla; ovary about 5 mm. long cylindrico-conoid grooved densely covered (except at top) with an indumentum of short-stalked few-branched rosette-hairs the branches both long and short of single broad vesicular brown cells, summit of ovary often bare of hairs; style pale-coloured glabrous, at top slightly expanded beneath the narrower red lobulate lipped stigma. Capsule dark-coloured slightly warted straight, oblique to pedicel at base, about 2.2 cm. long and 6 mm. in diameter dehiscing from the apex by 5 valves; seeds pale brown oblong about 2–2.5 mm. long and .75 mm. across rounded or notched at shortly prolonged chalazal end, fringed at prolonged funicular end, aril-wing well developed all round.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 11,000 ft. In open pine forests and on cliffs. Shrub of 10–15 ft. Flowers pale rose, with a blotch of crimson at base. G. Forrest. No. 14,450. July 1917.

W.N.-W.-Yunnan. On the Bei-ma Shan. Lat. 28° 12′ N. Alt. 13,000 ft. In pine forests. Shrub of 10–12 ft. Flowers flushed faint rose, with slight marking of crimson at base. G. Forrest. No. 14,461. July 1917.

S.E. Tibet. On Doker-la, Mekong-Salween divide. Lat. 28° 20′ N. Alt. 12,000 ft. In open Rhododendron thickets. Shrub of 6–8 ft. Flowers white, flushed pale rose on exterior, deepest on margin, with a small blotch of crimson at base. G. Forrest. No. 14,686. Aug. 1917.

S.E. Tibet. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 14,000 ft. In Rhododendron forest. Shrub of 12–15 ft. Flowers pale rose or washed rose, with crimson blotch at base. G. Forrest. No. 14,488. July 1917.

Rh. colletum is a distinct member of the Lacteum series. Its nearest ally is *Rh. Beesianum*, Diels, a species to which no precise relationship is entirely misconceived in the note to the description. *Rh. Beesianum* has no near phyletic relation to *Rh. Delavayi*, Franch., which is one of the Arboreum series. There is not even a shade of resemblance between the plants to warrant Diels' suggestion. The reminiscence in *Rh. Beesianum* of *Rh. sutchuenense*, Franch., which occurred to Diels, had no sound phyletic basis, but depended merely on the fact that both species have long narrow oblanceolate leaves which on dried twigs show a tendency to droop. *Rh. sutchuenense* finds its phylum in or near the Fortunei series.

The number of described and certain species of the Lacteum

series is as yet small—*Rh. lacteum*, Franch., *Rh. Beesianum*, Diels, *Rh. Traillianum*, Forrest et W. W. Sm., *Rh. colletum*, Balf. f. et Forrest, make a quartette at the moment. That there are others I know, but whilst a considerable number of specimens of members of the phylum are now in our possession, many are without flower—showing foliage alone or foliage with fruit. The specific segregation of this material in the circumstances is no easy task, and indeed must be in a measure tentative, awaiting confirmation by the collecting of future explorers. Meanwhile, for the information of anyone who wishes to know how to recognise a member of the Lacteum series—a truly natural phylum,—and as a basis for future work, let me say that the characters of the indumentum of the under side of the leaf are crucial. It is thin buff-coloured scintillating unistrate, forming a smooth soft surface consisting of rosette-hairs with some 4 to 5 broad short vesicular thin-walled unicellular branches arising from a common short base. The rosettes are quite separate though their branches more or less overlap, and it is the walls of these empty branch-cells which cause the iridescence of the leaf-surface when looked at through a magnifying glass. The rosettes are easily separated from the surface of the leaf. If they are scraped off on to the surface of a microscopic slide and a drop of alcohol be added to them, they diffuse through the fluid like a fine powder, and their form can then be readily seen. In no other Rhododendrons that have come under my observation is there an indumentum of this kind. It is to my present knowledge a critical differential character of *Rh. lacteum* and its allies, and it has the advantage of a character to be ascertained without difficulty. As I have described it, the character is not differential of species. But there are minor distinctions between the rosettes that are certainly specific in species recognisable by other characters. Its chief value lies in its differentiation of the Lacteum series. There are other Rhododendrons which show a thin buff-coloured scintillating indumentum forming a more or less smooth surface, but on applying in these cases the test I have mentioned the indumentum elements will not diffuse like a powder in the fluid—they adhere in groups, and have to be torn apart,—and this because the construction of the hairs is different and their branches interweave and interlock, holding the hairs together.

796 **Rhododendron comisteum,*** Balf. f. et Forrest.†

Leafy shrub of slow growth barely 1 m. high annual increments small, the leaves and scale-leaves (both outer and inner)

* *κομιστεός*, to be taken care of—as a most charming plant for the garden.

† *Rhododendron comisteum*, Balf. f. et Forrest.—Frutex nanus dense foliatus foliis per annos persistentibus. Rami dense rufescenti-tomentosi, tomento

of the foliage-bud persisting for several years. Branchlets stout completely enwrapped in a rufous or cinnamon-brown woolly indumentum which persists for several years becoming grey or black, densely leafy, three to five leaves crowning each annual growth. Foliage-buds oblong fusiform pointed; outer persistent scale-leaves about 9 mm. long and 2.5 mm. broad woody lanceolate from the base or elongated triangular or subelliptic or oblong tailed-acuminate nearly glabrous inside, densely tomentose outside with white woolly hairs, margin ciliate, tail enwrapped in white tomentum; inner scale-leaves membranous about 1.8 cm. long and 2 mm. broad, strap-shaped acute or obtuse with a blunt rounded mucro, outside more or less clad with white tomentose hairs, around the mucro rufously tomentose, margin ciliate; young foliage-leaves revolute, upper surface white with caducous long curled branched hairs. Leaves petiolate as much as 5.5 cm. long; lamina lanceolate or slightly oblanceolate about 5 cm. long by 1.3 cm. broad, apex obtuse or somewhat acute ending in a tuberculate mucro, margin strongly recurved, tapered gradually to the base; upper surface dark-green opaque shagreened glabrescent, midrib grooved, groove lined more or less by vestigial hairs, primary veins about 10–12 on each side slightly grooved; under surface with slightly prominent midrib, rest of venation concealed by a thick persistent bistrate woolly indumentum ferruginous—(or dark umber-coloured from penetration by fungi)—under stratum of rosette-hairs stalked and with broad thin-walled short vesicular branches, upper stratum of hairs with a long axis freely branching its cells thin-walled and curling intertwining; petiole about 5 mm. long enwrapped by indumentum like the stem. Flowers arranged in a 6-flowered terminal umbel, the pedicels encircled by the inner cucullate if not by the outer bracts; outer bracts like the outer scale-leaves of foliage-bud only larger, inner bracts (fertile ones) membranous yellow spathulate truncate or obtuse cucullate

persistente demum cinerascente, alabastrorum perulis exterioribus interioribusque persistentibus dense vestiti. Folia petiolata ad 5.5 cm. longa; lamina crasse coriacea lanceolata circ. 5 cm. longa 1.3 cm. lata obtusa mucronulata revoluta deorsum attenuata; supra atroviridis subrugulosa glabrescens; subtus cinnamomeo-tomentosa, tomento persistente bistrato, strati superi pilis elongatis multiramosis curvatis intertextis, strati inferi pilis breviter stipitatis ramis rosulatis brevibus; petiolus dense tomentosus ad 5 mm. longus. Umbella 6-flora; bracteae plus minusve persistentes, intimae cucullatae submembranaceae tomentosae; pedicelli ad 2 cm. longi dense tomentosi eglandulosi sub anthesi bracteis flavidis intimis basi cincti. Calyx parvus ad 3 mm. longus extus floccoso-tomentosus, 5-lobus; lobi floccoso-ciliati. Corolla rosea sparsim maculata tubuloso-campanulata circ. 3.7 cm. longa intus puberula, 5-loba; lobi rotundati emarginati. Stamina 10 inaequalia corolla breviora; filamenta puberula. Discus puberulus. Gynaeceum circ. 2.7 cm. longum corolla brevius staminibus longius; ovarium ovoideum truncatum circ. 3.5 mm. longum indumento pallide roseo e pilis longis constructo dense vestitum, eglandulosum; stylus glaber.

mucronulate or not about 2 cm. long and 8 mm. or more broad softly pubescent with adpressed white hairs rufescent around the mucro; bracteoles filiform about 5 mm. long softly pilose with adpressed hairs ; pedicels erect strict about 2 cm. long expanding below the calyx, densely tomentose with white or reddening woolly hairs, eglandular. Calyx small fleshy about 2–3 mm. long outside floccose-tomentose, margin of cup 5-lobed ; lobes red concave rounded or broadly triangular floccose, margin ciliate. Corolla tubular-campanulate rose with a very few posterior crimson spots, about 3.7 cm. long fleshy at base and 5-gibbous with faint imperfect interpetaline septa, glabrous outside, puberulous inside, 5-lobed ; lobes large rounded about 1.4 cm. long and 2 cm. broad emarginate and crenulate. Stamens 10 unequal shorter than corolla, longest about 2.2–2.4 cm. long with anther 2 mm. long, shortest about 1.4–1.6 cm. long with anther about 1.5 mm. long; filaments expanded downwards densely puberulous from the base over a small area. Disk green more or less puberulous. Gynaeceum about 2.7 cm. long longer than longest stamens shorter than corolla ; ovary ovoid grooved truncate 3.5 mm. long entirely covered by a pinkish tomentose indumentum of long erectly-branched hairs, eglandular ; style white glabrous slightly expanded below the lobulate lipped discoid stigma.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 14,000 ft. Open stony slopes and ledges of cliffs. Shrub of 2–2½ ft. Flowers soft rose with a few crimson markings. G. Forrest. No. 14,501. July 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 10′ N. Alt. 13,000 ft. On open pasture. Shrub of 2–3 ft. Flowers deep soft rose with a few crimson markings. G. Forrest. Nos. 14,508, 14,508A. July 1917.

One of the most charming amongst the many Rhododendrons discovered by Forrest in the home of the genus in the highlands of the Mekong-Salween divide on the borders of S.E. Tibet and Yunnan. It is of a type of Rhododendron which seems to prevail in the area and of which the lovely *Rh. sanguineum*, Franch., *Rh. Forrestii*, Balf. f., and their allies—and now this *Rh. comisteum*, leading to the Roxieanum series—are typical.

Rh. comisteum suggests at sight affinity with four species to which special reference is made elsewhere in these pages—*Rh. Forrestii*, *Rh. sanguineum*, *Rh. haematodes*, Franch., and *Rh. Roxieanum*, G. Forrest.

It is not a creeper, and has a truss with more flowers, and by these characters differs from *Rh. Forrestii* and its immediate allies, but the fashion in which the flower-pedicels stand up within a nest of the ascending yellow inner bracts is strongly reminiscent of *Rh. Forrestii*.

Rh. sanguineum and its immediate allies have a thin underleaf indumentum usually grey-white, and all the bracts fall away apparently at flowering. But in *Rh. citriniflorum*, Balf. f. et Forrest, one of the allies, the bistrate indumentum tends to become tomentose, although it does not reach copious development on that line. The cinnamon-coloured thick tomentum on the under surface of the leaves of *Rh. comisteum* is an evident mark of differentiation.

That tomentum brings *Rh. comisteum* towards *Rh. haematodes* and its immediate allies, but if superficially alike the indumentum in the two species is structurally different, for here in *Rh. comisteum* the copious branches of the hairs of the upper stratum, though somewhat vesicular, curl and interweave in a loose fashion but without forming tendrillar-like cords, whilst in *Rh. haematodes* the somewhat dendriform branched hairs form stiffer and narrower branches which are much shorter. Apart from indumentum, however, the broader and larger leaves of *Rh. haematodes* and its umbels without persistent bracts make a conspicuous difference.

There is no doubt, I think, about *Rh. comisteum* being in its right place within the circle of *Rh. Roxieanum*, as there so here the many persistent leaves densely clothe the stems, which are clad also with a dense indumentum at first cinnamon-coloured, becoming grey later on the exposed stems. And then there is a dense coating of persistent scale-leaves and bracts intermixed with the foliage-leaves and visible on the stems after the foliage-leaves have fallen. The flower-trusses are more open at flowering than is the case in *Rh. Roxieanum*, because perhaps the outer bracts fall, leaving only the inner ones. The indumentum of the underleaf surface outwardly identical is in internal construction a near approximation only to that of typical *Rh. Roxieanum*. There the hairs of the upper stratum become thick-walled and cord-like and intertwine and twist around one another like tendrils. In *Rh. comisteum* the hair-cells do not become cord-like, and are not markedly tendrilliform. Of the members of the Roxieanum series *Rh. bathyphyllum*, Balf. f. et Forrest, and *Rh. perulatum*, Balf. f. et Forrest, have somewhat similar indumentum, but in general aspect *Rh. proteoides*, Balf. f. et W. W. Sm., perhaps presents the most striking resemblances.

3974

Rhododendron dasypetalum,* Balf. f. et Forrest.†

Shrub barely 1 m. with many delicate ultimate branchings and short annual growths. Branchlets a year old about 1 mm.

* *δασύς*, hairy—in allusion to the corolla.

† *Rhododendron dasypetalum*, Balf. f. et Forrest.—Frutex vix 1 m. altus. Rami annotini circ. 1 mm. diam. squamis rufis stipitatis dense furfuracei, vetus-

in diameter densely and scurfily clad with stalked peltate rufous scales, scales blackening on older twigs which become dark-grey before shedding the bark. Foliage-buds oblong narrow covered by few scale-leaves; outer scale-leaves thick crustaceously leathery elongate-triangular or lanceolate tapering to a blunt point densely rufously lepidote outside, setulose-ciliate; inner scales straw-yellow-coloured membranous at first broadly ovate only slightly concave; innermost oblong carinate mucronulate not hooded elepidote on back or with one or two scales, at the apex conspicuously setulose-ciliate; young foliage-leaves convolute, on both surfaces epilose and densely lepidote, margin of both lamina and petiole setulose-ciliate. Leaves shortly petiolate about 1.5 cm. long; lamina thickly leathery oval or oblong-oval, apex obtuse or rounded mucronulate, about 6 mm. broad, margin slightly recurved and slightly notched sometimes with a few setulose hairs towards base, base obtuse or obtusely cuneate; upper surface dark-green somewhat glossy covered everywhere with discontiguous or almost contiguous white not scintillating peltate sessile hardly impressed scales each with broad umbo (sometimes slightly infiltrated with yellow secretion) and equally broad translucent fringe, intervals between the scales less than diameter of scale, midrib scarcely grooved; under surface tawny-brown clad with contiguous overlapping uniform concolorous persistent stalked peltate scales each with its stalk sunk in a shallow pit and having a dark-brown umbo and a paler buff-coloured equally

tiores nigro-verruculosi. Alabastrorum perulae extimae elongato-triangulares extus rufo-lepidotae setuloso-ciliatae, intimae membranaceae oblongae extus elepidotae; folia juvenilia utrinque epilosa margine setuloso-ciliata. Folia petiolata circ. 1.5 cm. longa; lamina crasse coriacea ovalis vel oblongo-ovalis apice obtusa vel rotundata mucronulata, margine paullo crenulata setulis paucis basim versus notata, basi obtusa vel late cuneata; supra atroviridis subnitens squamis albidis haud scintillantibus discontiguis cinerea costa media vix sulcata; infra fulva squamis contiguis imbricatis uniformibus concoloribus stipitatis vestita costa media elevata; petiolus circ. 1 mm. longus dense lepidotus sparsim setuloso-ciliatus. Flores in umbellas 2-floras terminales dispositi; bracteae mox deciduae; bracteolae brevissimae vix 2 mm. longae pedicellis breviores subsetuliformes; pedicelli circ. 4.5 mm. longi pubescentes sparsim lepidoti. Calyx cupularis circ. 3.5 mm. longus 5-partitus; cupula pilis adpressis dense pubescens et pilis setulosis paucis squamisque peltatis ramentaceis obtecta; lobi subaequales oblongo-ovales vel lanceolati ad 1.5 mm. lati violaceo-purpurei extus intusque puberuli etiam extus squamis peltatis paucis magnis induti, margine pilis lanatis hirsuti. Corolla laete purpureo-rosea ad 1.7 cm. longa extus pilis contortis vestita, elepidota; tubus campanulatus circ. 4 mm. longus ad os villosus; lobi 5 tenues circ. 1 cm. longi 6 mm. lati oblongo-ovales rotundati crenulati. Stamina 10 inaequalia corolla breviora alternatim longiora et breviora; filamenta puberula. Discus puberulus. Gynaeceum circ. 1.8 cm. longum corolla paullo longius staminibus multo longius; ovarium conoideum truncatum circ. 3 mm. longum infra adpressim puberulum sursum imbricatim lepidotum et puberulum; stylus glaber nunc pilos paucos basales gerens. Capsula circ. 4 mm. longa 1.75 mm. lata pallida dense lepidota et puberula lobis calycis plus minusve **inclusa ab apice ad basim valvis 5 dehiscens.**

broad fringe, midrib slightly prominent; petiole about 1 mm. long densely lepidote like stem and with a few setulose cilia. Flowers in 2-flowered terminal short umbels; bracts early deciduous, outer ones crustaceous with thinner margin, dark-brown rounded apiculate as much as 4 mm. in diameter densely puberulous outside and inside, elepidote outside but occasionally one or two scales at apex, whitely ciliate, inner fertile bracts membranous venulose broadly oblong with nearly parallel sides somewhat truncate, puberulous outside elepidote setulose-ciliate particularly at top; bracteoles very short about 2 mm. long shorter than pedicels almost bristle-like, membranous brown with a few short cilia and one or two long hairs at tip; pedicels about 4.5 mm. long dark-purple pubescent and lepidote with few or many scattered scurfy stalked membranous yellowish-white peltate scales. Calyx cupular about 3.5 mm. long 5-partite; cup dark black-purple densely pubescent with white adpressed hairs and a few longer setulose hairs and some intermixed scurfy whitish peltate scales; lobes nearly equal oblong-oval or somewhat lanceolate or ovate acute as much as 1.5 mm. broad, violet-purple puberulous inside and outside, on the back also a few large peltate whitish scales often only at the base, hirsute on margin with long lanate hairs. Corolla bright purplish-rose as much as 1.7 cm. long outside pilose with long delicate twisting hairs extending over base of lobes, elepidote; tube campanulate about 4 mm. long villous at the throat, expanding into a spreading 5-lobed limb; lobes thin as much as 1 cm. long and 6 mm. broad oblong-oval rounded at tip crenulate. Stamens 10 much shorter than corolla, alternately long and short, longer about 1 cm. long with pale-brown anther about 2 mm. long, shorter about 8.5 mm. long with anther about 1.5 mm. long; filaments slightly widened at the hardly naked base, from the base upwards to mouth of corolla-tube puberulous. Disk puberulous below ovary. Gynaeceum about 1.8 cm. long a little longer than corolla much longer than stamens; ovary conoid truncate grooved about 3 mm. long, below adpressedly puberulous, upwards densely imbricately lepidote with yellowish scales and puberulous with intermixed short hairs; style purple glabrous or occasionally a few short hairs at base not clavate under the broader discoid lobulate lipped darker purple stigma. Capsule small about 4 mm. long and 1.75 mm. in diameter pale-coloured densely lepidote and also puberulous enclosed for about two-thirds by the slightly enlarged calyx-lobes, dehiscent from apex to base by 5 valves.

N.W. Yunnan. On the Li-ti-ping. Open stony pasture. Alt. 11,000 ft. Lat. 27° 12′ N. Shrub of 1–2½ ft. Flowers bright purplish-rose. G. Forrest. No. 13,905. June 1917.

This very distinct species finds its place in the Lapponicum

series along with a small number of species—*Rh. cheilanthum*, Balf. f. et Forrest, *Rh. cuneatum*, W. W. Sm., *Rh. nitidulum*, Rehd. et Wils., *Rh. tapetiforme*, Balf. f. et Ward—in which the scales of the under-leaf indumentum are uniform concolorous contiguous forming a fulvous surface. From these species with like indumentum it is at once separated by its corolla with hairy outer surface. This is an unusual feature amongst Lapponicums. We have it in the yellow-flowered *Rh. primulinum*, Franch., and in the purple-flowered *Rh. russatum*, Balf. f. et Forrest. It is more a character of the Cephalanthum series. It is found also in *Rh. sempervirens*, Hort., and conspicuously in *Rh. dauricum*, Linn.

From the four species I have named in the subseries into which its indumentum brings it there are abundant other characters of distinction in addition to that of the hairs on the outside of the corolla :—

Rh. cheilanthum has larger and broader leaves with a zygomorphous corolla and the style about equal in length to corolla and stamens.

Rh. cuneatum has leaves many times the size, has larger flowers pronouncedly zygomorphous, lepidote corolla and a long protruding style.

Rh. tapetiforme is a dwarf carpet-forming species with a darker more rufous indumentum bearing pink flowers in 3-flowered compact trusses with shorter pedicels, bracteoles longer than the pedicels, calyx shorter barely 1 mm. long with lobes somewhat semi-lunate, style glabrous.

Rh. nitidulum has scintillating amber-coloured scales on upper leaf-surface, shorter calyx about 2 mm. long, corolla lepidote outside and glabrous style.

The general habit of the plant and form of leaves recall *Rh. scleroclad*um, Balf. f. et Forrest, but that species has an indumentum of bicolorous scales and has no hairs on outside of its very markedly zygomorphous corolla.

As a horticultural plant *Rh. dasypetalum* does not make claim to much merit. There is no outstanding feature to give it preference over many another of the Lapponicum series, indeed its dull foliage has in dried specimens a drab appearance that is not promising.

4797 **Rhododendron detonsum,*** Balf. f. et Forrest.†

Shrub 3–4 m. high with stout branches about 5 mm. in diameter when a year old, green glistening having scattered large red

* *detonsum*, shorn—in allusion to the fallen indumentum.

† *Rhododendron detonsum*, Balf. f. et Forrest.—Frutex ad 4 m. altus ramis crassis subnitentibus glandulas rubras et pilos floccosos conspersim gerentibus ;

glands and a few floccose reddening twisted hairs. Foliage-bud large elongated ovoid; outer scale-leaves more or less rounded or elliptic or oblong-oval glossy inside, glandular (red glands) and densely covered with branched sticky reddening hairs outside, margin gland-ciliate; innermost scale-leaves spathulate from a narrow base about 5 cm. long and 1 cm. broad at top, clad like the outer ones; young foliage-leaves revolute, on both surfaces clad with red clavate glands and stiffly radiating branched floccose hairs. Leaves as much as 14.5 cm. long petiolate; lamina leathery about 12 cm. long 4 cm. broad oblong, apex slightly narrowed into a beak with an apiculus 1.5 mm. long, margin cartilaginous slightly recurved, base broadly obtuse or rounded; upper surface pale green opaque, surface smooth with a few flocks and vestiges of others and of red glands, midrib grooved groove sparingly lined by floccose hairs and glands, primary veins about 14 on each side almost hidden; under surface pale cinnamon-brown clad with bistrate indumentum, the upper layer of brown detaching floccose hairs each with a short stalk and several diverging pointed branches, the lower stratum below the hairs of red clavate short glands on a pale mat-green surface, midrib broad elevated slightly pinkish sparingly floccose, primary veins paler slightly prominent; petiole stout about 2.5 cm. long, grooved above more or less coated with floccose red-brown hairs also glandular, glabrescent. Inflorescence shortly racemosely umbellate about 10-flowered, rhachis barely 1 cm. long sparsely glandular and floccose; fertile bracts papery oblong or obovate-oblong cucullate as much as 2.5 cm. long 1 cm. broad outside and inside densely sericeous or lanate the hairs white curling; bracteoles claviform about 1.2 cm. long densely whitely hairy hair-crested eglandular; pedicels stout diverging, as much as 3 cm. long, more or less glandular (glands red shortly-stalked) and sparingly floccose. Calyx about 3 mm. long; cup glandular outside 5-lobed to beyond middle; lobes membranous broad ovate obtuse sparingly glandular outside densely gland-fringed. Corolla openly campanulate rose-pink marked posteriorly by a few crimson

alabastra subglutinosa, foliis juvenilibus revolutis utrinque glandulosis et floccosis. Folia ad 14.5 cm. longa; lamina ad 4 cm. lata coriacea apice paullo attenuata subrostrata, basi late obtusa vel rotundata; supra opaca vestigiis glandularum floccorumque notata; infra cinnamomea indumento bistrato detersili pilorum rosulatorum obtecta; petiolus ad 2.5 cm. longus glabrescens. Inflorescentia racemoso-umbellata circ. 10-flora; bracteae extus intusque lanato-pubescentes; bracteolae pedicellis dimidio breviores; pedicelli glandulosi et floccosi ad 3 cm. longi. Calyx conspicuus ad 3 mm. longus glandulosus; lobi 5 glandulis ciliati. Corolla aperte campanulata pallide rosea maculata circ. 4.8 cm. longa intus puberula; lobi 8 mm. longi. Stamina inaequalia; filamenta puberula. Discus puberulus. Gynaeceum corolla brevius, staminibus longius; ovarium dense glandulosum; **stylus glandulosus.**

spots, about 4.8 cm. long, glabrous outside, puberulous at the base inside, not gibbous, 5-lobed; lobes short and broad about 8 mm. long and 3 mm. broad emarginate crenulate. Stamens 10 unequal, shorter than corolla, longest about 3.3 cm. long with anther oblong 4 mm. long, shortest about 2 cm. with anther 3 mm. long; filaments expanding to the base and from there through about one-third finely puberulous. Disk puberulous below ovary. Gynaeceum about 3.8 cm. long shorter than corolla longer than stamens; ovary about 6 mm. long dark-brown when dry, conoid truncate slightly grooved densely glandular, glands shortly-stalked; style glandular through three-fourths of length glabrous in upper fourth, hardly expanding below a broad discoid lobulate lipped stigma.

E. N.-W.-Yunnan. Sungkwei divide. Eastern flank. Alt. 10,000–11,000 ft. Lat. 26° 12′ N. Margins of maple forests. Shrub of 9–12 ft. Flowers fragrant fleshy rose-pink, with few markings. G. Forrest. No. 13,789. May 1917.

A species which in the outward appearance of its detersile indumentum recalls *Rh. floccigerum*, Franch., but whilst the upper stratum of indumentum in the two species is formed of similarly constructed hairs, the under stratum here is glandular, in *Rh. floccigerum* consists of vesicular rosette-hairs. It is not really an ally of *Rh. floccigerum*, wanting the caudate scale-leaves to the foliage-bud seen in that species, having a non-fleshy not tubular-campanulate corolla, and the ovary is glandular not floccose, the style glandular not glabrous or nearly so. The well-developed calyx, the glandular ovary, and glandular style may lead one to the Souliei series, but the foliage and its indumentum are very different. From the general facies of the plant and its inflorescence one might be excused for taking it at first glance to be a relative of *Rh. Traillianum*, G. Forrest et W. W. Sm. of the Lacteum series, which it is not.

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Rhododendron dimitrum,* Balf. f. et Forrest.†

Small shrub not 2 m. high with short straight branches some 2.5 mm. in diameter when a year old and then glab-

* *δίμιτρος*, with double cap—in allusion to the very large calyx.

† *Rhododendron dimitrum*, Balf. f. et Forrest.—Frutex vix 2 m. altus. Rami breves annotini ad 2.5 mm. diam. glabrescentes. Folia petiolata ad 7.5 cm. longa; lamina coriacea oblonga vel ovali-oblonga ad 6.5 cm. longa 2.5 cm. lata apicem versus angustata nec rotundata breviter acuminata, margine recurva, basi obtusa nec rotundata; supra convexa pallide viridis opaca laevis costa media sulcata pilorum floccosorum vestigiis notata eglandulosa; infra flavido-viridis glabra sed costa media obscure floccosa et venis primariis utrinque ad 12 prominulis; petiolus circ. 1 cm. longus suberubescens obscure floccosus. Umbella racemosa 10–12-flora; bracteolae ad 7 mm. longae; pedicelli circ. 1 cm. longi eglandulosi floccoso-pubescentes. Calyx foliaceus erubescens circ. 1 cm. longus

rescent showing vestiges of floccose branched hairs and with a slightly glaucous look. Foliage-bud ovoid pointed short, outer crustaceous scale-leaves rounded keeled with an apiculus or short tail, outside clad with a thin layer of floccose interwoven hairs hardly tomentose. Leaves petiolate as much as 7.5 cm. long; lamina leathery oblong or narrowly oval-oblong, as much as 6.5 cm. long 2.5 cm. broad, narrowed to the point and there shortly acuminate with a conspicuous mucro, margin cartilaginous recurved, base obtuse never rounded or cordulate; upper surface markedly convex pale green mat showing a grooved midrib, otherwise smooth not rugulose or shagreened the primary veins not showing, glabrescent but marked by vestiges of juvenile floccose hairs, eglandular; under surface yellowish green with a prominent midrib, the primary veins about 12 on each side slightly raised the rest of the venation forming a veiled reticulum, the whole surface is glabrous but traces of flock-hairs appear on sides of midrib; petiole 1 cm. or more long reddening grooved above with traces of withered floccose hairs. Flowers in a terminal raceme or umbel 10-12-flowered, the rhachis about 1.2 cm. long more or less floccose; bracts unknown; bracteoles filiform-clavate about 7 mm. long pilose from base and densely hair-crested; pedicels about 1 cm. long densely floccose pubescent eglandular expanding below the calyx. Calyx foliaceous oblique split to near the base in front, 1 cm. or more long with a broad cup-shaped base and 5 unequal pink lobes; cup about 3 mm. long fleshy at base and there floccose, more membranous above below the lobes which are glabrous but for floccose cilia, posterior lobes the larger as much as 7 cm. long spotted triangular or ovate or oblong often fringed and lobulate, anterior lobe smallest barely 2 mm. long rounded or semi-lunate, the membranous portion of the calyx often falling from the fleshy base of the cup and so giving the impression of a small toothed calyx. Corolla tubular campanulate deep rose with crimson spots all over three posterior petals, about 3.8 cm. long; tube fleshy at base 5-gibbous without basal blotches or faintly blotched on posterior petal, with 5 imperfect interpetaline septa, puberulous inside, glabrous outside; lobes 5 rounded emarginate about 1.5 cm. long

zygomorphus antice ad basim fissus; cupula lata ad 3 mm. longa basi carnea lobos 5 inaequales gerens; lobi membranacei maculati posteriores maximi. Corolla tubuloso-campanulata kermesina postice dense maculata circ. 3.8 cm. longa; tubus basi carneus 5-gibbosus intus puberulus septis interpetalinis incompletis divisus; lobi 5 rotundati emarginati. Stamina 10 inaequalia corolla breviora; filamenta flavida puberula. Discus glaber. Gynaeceum ad 3.4 cm. longum, corolla brevius, staminibus longius; ovarium tenue ad 6 mm. longum cylindricum sulcatum truncatum indumento flavido e pilis fasciatis constructo dense obtectum eglandulosum; stylus ad medium et ultra floccosus eglandulosus.

1.8 cm. broad. Stamens 10 unequal shorter than corolla, longest about 3.2 cm. long with anther 3 mm. long, shortest about 2.2 cm. long with anther 2 mm. long; filaments yellow only slightly widened downwards, puberulous at the base. Disk glabrous. Gynaeceum about 3.4 cm. long shorter than corolla a little longer than stamens; ovary about 6 mm. long very narrow cylindric eglandular grooved truncate densely clad with ascending fasciate few-branched hairs with sharp points forming an adpressed tomentum and a tuft round base of style; style floccose to above middle, eglandular.

Mid W.-Yunnan. Western flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000 ft. In open thickets. Shrub of 4–6 ft. Flowers deep rose with crimson markings. G. Forrest. No. 13,736. May 1917.

This plant has special botanical interest. *Rh. neriiflorum*, Franch. is its nearest ally, and *Rh. dimitrum* differs in the leaf-form—leaves tapered never rounded at the apex and the shape tending to oval; in the green not glaucous under surface of the leaf—*Rh. dimitrum* wanting the long epidermal wax-secreting papillae of *Rh. neriiflorum*; in the glabrous underleaf midrib—not coated profusely with floccose hairs as in *Rh. neriiflorum*; in the paler coloured calyx-lobes abundantly spotted with crimson; in the puberulous corolla-tube and puberulous staminal filaments—these being glabrous in *Rh. neriiflorum*. *Rh. dimitrum* is a plant of the western flank of the Tali Range, a region from which apparently only a small number of plants have come to us. Delavay, to whom our first knowledge of Yunnan Rhododendrons is due, collected mainly on the eastern flank and in the area immediately to the north and north-east of Tali itself—about Langkiung. On the eastern flank of the Tali Range *Rh. neriiflorum* must be not uncommon. We have it from Delavay under Nos. 294, 2061, and from Forrest under Nos. 4140, 4144, 4147, 4164, 6766, 6780, 11,617. The flora of the western flank shows differences from that of the eastern flank, as Forrest has acutely observed, but the differences are often not easily focussed. Here in *Rh. dimitrum* we have a species which illustrates modification of a phylum on opposite sides of the range, and the differential characters are easily recognised, although the determining factors are not yet apparent to us. On the Shweli-Salween divide occur plants which in the dried specimens collected by Forrest under Nos. 8939, 11,911, 11,921 do not offer marks sufficient to separate them from *Rh. neriiflorum* of the eastern flank of the Tali Range, yet they suggest differences which, if we knew more of the plants, we might appraise as of some distinctive value. For the present we have to reckon them as

Rh. neriiflorum. It is not rash to expect that further exploration of this extreme west boundary of Yunnan will bring to light other allied species.

Rh. neriiflorum and this new species *Rh. dimitrum* do not leave us in doubt about their affinity. They belong to a large group of species with beautiful flowers that includes the Forrestii series, the Sanguineum series, and the Haematodes series. Their characters which entitle them to rank as a series and to be spoken of as the Neriiflorum series alongside of those mentioned are the great reduction of the under-leaf indumentum —restricted to a floccose covering of the midrib—and the great development of the calyx. The large group embracing all these series and perhaps others may be looked upon as one parallel with but differing from that of Thomsoni, to which I have referred elsewhere.*

Rh. neriiflorum has been in cultivation for some years—introduced in 1910 by Bees, Ltd., through seed collected by Forrest,—and has flowered freely. Of itself a charming plant it will be doubtless the parent of many hybrids in our gardens. No artificial hybrids of flowering age have yet been raised in cultivation, but two distinct remarkable plants have appeared in gardens—one with Mr. J. C. Williams at Caerhays, the other with Mr. Magor at Lamellen,—which it has been suggested may be natural hybrids that have sprung from seed introduced with the seeds of one of their respective parents. To these reference must be made here.

In spring of 1918 Mr. J. C. Williams sent to me a truss of a "rogue" of which several individuals had appeared amongst his plants of *Rh. callimorphum*, Balf. f. et W. W. Sm. This rogue-plant has flower-characters resembling those of *Rh. neriiflorum*, and vegetative characters belonging to *Rh. callimorphum*. The flowers are smaller than those of *Rh. neriiflorum*. The calyx shows the unequal large-fringed lobes and the same splitting in front as we find in *Rh. neriiflorum*, but both calyx and corolla are spotted with crimson, and this is unknown in *Rh. neriiflorum*. The ovary is more truncate at the top, and the style is glabrous, not floccose, at the base. The flower is altogether different from that of *Rh. callimorphum*, where the pedicels are glandular not floccose, the calyx minute, corolla openly campanulate and rose-coloured, and the ovary is glandular, as is the base of the style. The vegetative character in which the rogue resembles *Rh. callimorphum* and differs altogether from *Rh. neriiflorum* is the setulose-glandular surface of the young stems of the petioles and of the lamina of the young leaves. The setae are not very long, but densely clothe the parts. In

* See Notes, R.B.G., Edin., x (1917), 98.

shape the leaf of the rogue is nearer to *Rh. callimorphum* than to *Rh. neriiflorum*, but is more pointed than in either, and it wants the glaucous under-leaf surface of both: that surface is green in the rogue. *Rh. neriiflorum* is particularly glaucous—the epidermal papillae upon which the wax—giving glaucousness—lies are long rod-like and somewhat spreading, not close-set; in *Rh. callimorphum* the papillae are much shorter, of an elongated dome-shape, and more close-set. But although the rogue has leaves not glaucous below, it has epidermal papillae which are not those of either of the species, but are likest to those of *Rh. callimorphum;* it apparently does not secrete wax to the extent observable in the two species. Surveying all the characters of the rogue so far as they are known to me, and comparing them with those of the two species suggested for its parentage as a natural hybrid, the evidence seems to point in the direction of correctness of the view that hybridisation has occurred. Technical characters possessed by the rogue but not found in the suggested parents are:—the more pointed leaf, the green under-leaf surface, the spotting of the corolla, and the glabrous style. These seem to be all. Through *Rh. dimitrum* we know now of the occurrence of the first three of these characters in the phylum of *Rh. neriiflorum*, and it may be, if hybridisation has taken place, that *Rh. dimitrum* and not *Rh. neriiflorum* has been the species with which *Rh. callimorphum* has crossed. At the same time the stamens of the rogue are the glabrous ones of *Rh. neriiflorum*, not the puberulous ones of *Rh. dimitrum*. The facts of distribution as we know them would not negate the possibility of hybridisation. For *Rh. callimorphum* from the Shweli-Salween divide and *Rh. dimitrum* from the western flank of the Tali Range are as yet only known to us in single collectings, and their habitats are sufficiently within hail to justify the looking to future exploration for the discovery of one or both of them in the intermediate area. This rogue, to which I have given the name **Rh. dimidiatum**, in allusion to its split calyx, is a most interesting plant whether species or hybrid, and further study of it in cultivation is desirable.

Not many days after my receipt of this *Rh. dimidiatum* from Mr. Williams there came to me from Mr. Magor a truss of a Rhododendron with a flower for all the world like a "hose-in-hose" *Rh. neriiflorum*. It too was a rogue, but amongst *Rh. habrotrichum*, Balf. f. et W. W. Sm., not amongst *Rh. callimorphum*, as was the Caerhays plant. At first looking I thought we had to deal with the same form in both plants. Mr. Williams, to whom Mr. Magor sent specimens of his plant, doubted their being the same, and subsequent analysis confirms this opinion.

Rh. diphrocalyx *—by which name Mr. Magor's plant is known —shows a larger flower than belongs to *Rh. dimidiatum*. The flowers are, as has been stated, outwardly like those of *Rh. neriiflorum*. The calyx is remarkable from its size—on the posterior side reaching to the top of the corolla-tube, and being as brightly coloured as the corolla. Both calyx and corolla are spotted. Other flower-differences from *Rh. dimidiatum* are—the stamens are puberulous and the style is floccose. The former is a character of difference too from *Rh. neriiflorum*, the latter one of resemblance with it, and the ovary also has more of a taper at the top, as we find it in *Rh. neriiflorum*. The puberulous stamens are found in *Rh. dimitrum*, as is also the floccose style. In the foliage we find pointed leaves and a green under surface to the leaf, and there are setulose glands on the lamina, petiole, and young stems, as there are in *Rh. dimidiatum*. The glands are larger and more conspicuous, and the epidermal papillae are more numerous and form lower domes than in *Rh. dimidiatum*.

The same question of natural hybridisation is raised by Mr. Magor's plant—but with the different element of *Rh. habrotrichum* as a parent instead of *Rh. callimorphum*.

Rh. habrotrichum is a Shweli-Salween plant, and the distributional elements in the problem are therefore the same in the two cases. Structurally *Rh. habrotrichum* is a plant with large leaves as much as 12 cm. long and 7 cm. in diameter, and they are pointed. They as well as the stems carry quite long setulose glands with a few hair-flocks, and the glands are very persistent: the leaves and stems are not glabrescent above. The under surface of the leaves is green, not glaucous, and the papillae are quite low domes. The flowers have a minute calyx without membranous expansions, the corolla is funnel-shaped unspotted and without blotches, the stamens are puberulous, and the truncate glandular setose ovary has a style glandular-setose in its lower third. Sifting the evidence here leads to much the same conclusion as was arrived at in the case of *Rh. dimidiatum*. If hybridisation by *Rh. habrotrichum* has taken place in nature, *Rh. dimitrum* is more likely than *Rh. neriiflorum* to have been the other parent. For purposes of comparison the tabular statement presented here, of differentiating characters of the suggested parents and their hybrid progeny, may be of use :—

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* *διφρος*, chariot-board—in allusion to the form of the calyx.

Neriiflorum.	*Dimitrum.*	*Callimorphum.*	*Habrotrichum.*	*Dimidiatum.*	*Diphrocalyx.*
Young stems floccose with white flocks.	Young stems floccose.	Young stems shortly setulose-glandular and floccose.	Young stems with long setose glands and some hair-flocks.	Young stems shortly setulose-glandular with brown flocks.	Young stems with long setulose glands and brown flocks.
Leaves oblong not pointed, base obtuse.	Leaves oblong or oval-oblong pointed, base obtuse.	Leaves rounded or broadly elliptic not pointed, base cordulate or subtrunculate.	Leaves elliptic - oblong obtuse or subacuminate, base cordulate.	Leaves oblong or oblong-oval pointed, base obtuse or slightly rounded or approaching cordulate.	Leaves pointed, base obtuse.
Upper surface floccose when young, neither setulose nor glandular.	Upper surface with floccose hairs never setulose nor glandular.	Upper surface at first floccose with a few setulose glands.	Upper surface at first setulose-glandular and floccose.	Upper surface setulose-glandular and floccose.	Upper surface along the midrib setulose-glandular and brown-floccose.
Under surface glaucous, more or less floccose at first.	Under surface pale green, faintly floccose.	Under surface glaucous with a few short red glands.	Under surface green setulose-glandular and floccose.	Under surface green setulose-glandular and floccose, particularly on midrib.	Under surface green setulose-glandular and floccose.
Petiole floccose at first, eglandular.	Petiole with traces of flocks, eglandular.	Petiole gland-setulose and brown-floccose.	Petiole with long glandular setae and a few flocks.	Petiole shortly setulose-glandular and floccose.	Petiole with long setulose glands and brown flocks.
Pedicels floccose eglandular.	Pedicels floccose eglandular.	Pedicels glandular.	Pedicels setulose-glandular.	Pedicels floccose eglandular.	Pedicels floccose eglandular.
Calyx large, split in front, unequally lobed, glabrous outside, unspotted.	Calyx large, split in front, unequally lobed, glabrous outside, spotted.	Calyx minute about 1.5 mm. long gland-setulose outside, unspotted.	Calyx large, much shorter than corolla-tube, subequally lobed, glandular outside, unspotted.	Calyx large, half length of corolla-tube, split in front, unequally lobed, glabrous outside, spotted.	Calyx large, split in front, as long as or longer than corolla-tube, unequally lobed, fringed, glabrous, outside spotted.
Corolla tubular-campanulate, bright red, unspotted, 5 conspicuous basal blotches.	Corolla tubular-campanulate, bright red, spotted, faint basal blotches.	Corolla openly campanulate, rose-coloured, unspotted, with a basal blotch.	Corolla funnel - shaped, pale rose, unspotted, unblotched.	Corolla tubular-campanulate, deep red, spotted, faint basal blotching.	Corolla tubular-campanulate, bright red, spotted, 5 faint basal blotches.
Stamens glabrous.	Stamens puberulous.	Stamens almost glabrous.	Stamens puberulous.	Stamens glabrous.	Stamens puberulous.
Ovary tapered floccose eglandular.	Ovary truncate floccose eglandular.	Ovary truncate glandular.	Ovary truncate glandular-setose.	Ovary truncate floccose eglandular.	Ovary tapered floccose-eglandular.
Style glabrous.	Style floccose to above middle.	Style glandular at base.	Style glandular-setose in lower third.	Style glabrous.	Style floccose through lower two-fifths.

It must be borne in mind that this discussion is tentative. We have as yet seen too little of the plants and have too little material to work with for a thoroughly critical analysis of the problem. But it seems to me worth while to give this exposition of facts because of their bearing upon the question of Rhododendron-hybrids in nature. Had we no knowledge of *Rh. neriiflorum* or of *Rh. dimitrum*, the forms *Rh. dimidiatum* and *Rh. diphrocalyx* would, by all the canons of systematic botany, be recognised as two species (possibly to some as microforms of one), without near affinity with either *Rh. callimorphum* or *Rh. habrotrichum*. If *Rh. callimorphum* and *Rh. habrotrichum* had been undiscovered, there would have been no hesitation on the part of systematists over describing *Rh. dimidiatum* and *Rh. diphrocalyx* as two species (or microforms of one) allied to but quite distinct from *Rh. neriiflorum* and from *Rh. dimitrum*. With all the forms before us, the suggestion of hybridisation as the method of origin of *Rh. dimidiatum* and *Rh. diphrocalyx* is legitimate. If this is the true history, these forms must be hybrids that have arisen in nature; and this has support in the first appearance of *Rh. dimidiatum* amongst seedling plants of *Rh. callimorphum*, of *Rh. diphrocalyx* amongst seedling plants of *Rh. habrotrichum*. *Rh. neriiflorum* was introduced to cultivation in 1910, *Rh. habrotrichum* in 1912, *Rh. callimorphum* in 1914. I do not know if *Rh. dimitrum* is yet in cultivation, and the time that has elapsed since any of them came into our gardens—perhaps I should put it since the first record of their flowering, the all-important *Rh. dimitrum* being, as I believe, still absent—is too short for the production of flowering plants in progeny from artificial crossing. We have therefore here a critical case in which synthesis may confirm or otherwise the conjectures of analysis which the method is inadequate to establish on the material available. If *Rh. dimitrum* is not yet in cultivation, it is a plant to be resolutely sought for in view of its importance as an element in the question that has to be answered. Meanwhile cultivators of Rhododendrons who interest themselves in hybridisation, and who have in their collections plants of the species required, should endeavour, by making such a series of crosses as *neriiflorum* × *callimorphum*, *habro-neriiflorum* × *habrotrichum*, *callimorphum* × *neriiflorum*, *habro-trichum* × *neriiflorum*, to find out for us what are the characters of the first-crosses that come from such parentage; and should also, by crossing directly and reciprocally *Rh. dimidiatum* and *Rh. diphrocalyx* with their reputed parents, try to discover through Mendelian segregation evidence of the parental relationships of the two forms. Speculation is frequent upon the part that hybridisation in nature has played in the production of

forms amongst the numerous Himalayan Rhododendrons that have been described as species, and now in the much larger field of Chinese Rhododendrons there is similar questioning. Dried herbarium specimens can only supply a part of the evidence that is required for the solving of a biological problem of this kind ; the other part must come from direct observation by the collector in the habitats of the plant, and from observation and experimental work in our gardens. The cases presented here offer elements in a simple form for such experimental work which, if rightly pursued, may furnish us with proof that the plants we have been discussing are illustrations of natural hybrids amongst Rhododendrons.

4799 **Rhododendron dryophyllum,*** Balf. f. et Forrest.†

Eglandular shrub as much as 3 m. high with rigid straight branches. Branches of the year as much as 3 mm. in diameter enwrapped in a buff-coloured thin indumentum of short-stalked rosette-hairs, some with long intertwining vesicular branches, others with short ones, the indumentum persisting more or less for several years appearing as a black coating on the reddened older parts of the branches. Foliage-buds narrow fusiform pointed somewhat chestnut-brown ; outer scale-leaves crustaceous more or less rounded and apiculate or tailed rufous-brown keeled, about 7 mm. long ; inner scale-leaves oblong-oval or obovate ; innermost ligulate-spathulate mucronate membranous yellowish about 2.5 cm. long, clad like all scale-leaves with a thin tomentose indumentum of branched floccose hairs at first white becoming red and greasy, very dense around the

* *δρυόφυλλος*, with leaves like oak—the leaves are quite like those of many Eastern oaks.

† *Rhododendron dryophyllum*, Balf. f. et Forrest.—Frutex ad 3 m. altus ramis tenuiter tomentosis, tomento persistente. Alabastra fusiformia acuta, perulis extimis crustaceis rotundatis apiculatis extus rufo-tomentosis, intimis ligulato-spathulatis chartaceis. Folia petiolata ad 16 cm. longa ; lamina coriacea oblonga vel oblongo-lanceolata ad 14 cm. longa 3.5 cm. lata subrostrata, margine plana, basi cuneata ; supra nitens brunnea (in siccitate), pilorum vestigiis notata, costa media sulcata venis primariis utrinque ad 18 obscuris ; infra flavido-fulva ubique indumento denso laevi persistente e pilis rosulatis longe ramosis et breviter ramosis constructo vestita, costa media elevata ; petiolus ad 2 cm. longus plus minusve tomentosus. Umbella vel racemo-umbella circ. 16-flora, rhachi floccosa ; bracteae pubescentes ; bracteolae filiformes ad 1.2 cm. longae pilosae ; pedicelli tenues stricti ad 2.5 cm. longi floccosi eglandulosi. Calyx minutus carneus 5-lobus lobis ovatis vel rotundatis circ. 1.5 mm. longis, glaber margine loborum minutissime floccoso excepto. Corolla infundibuliformi-campanulata alba roseo-suffusa et maculata circ. 4 cm. longa, intus puberula ; lobi 5 rotundati emarginati circ. 1.8 cm. longi 2.2 cm. lati. Stamina 10 inaequalia corolla multo breviora ; filamenta fere glabra. Discus puberulus. Gynaeceum corolla paullo brevius, staminibus multo longius ; ovarium cylindricum sulcatum truncatum glabrum ; stylus glaber.

apiculus and mucro, margin floccósely ciliate the hairs becoming rufous-red. Leaves petiolate persisting for 2 or 3 years as much as 16 cm. long patent not deflexing under the flowers ; lamina leathery oblong or oblong-lanceolate as much as 14 cm. long 3.5 cm. broad, apex narrowed to a shortly acuminate beak-like tip with a conspicuous apiculate red terminal hydathode, margin plane slightly cartilaginous, base cuneate or obtuse, sides of the lamina distinctly concave below ; upper surface glossy rich umber-brown (when dry) somewhat shagreened glabrescent but showing withered grey or reddish remains of juvenile floccose hairs, midrib grooved reddened and lined by vestiges of floccose hairs, primary veins indistinct as many as 18 on each side ; under surface yellow-buff smooth traversed by a prominent slightly pink-tinted midrib, rest of venation concealed, everywhere covered with an indumentum of short-stalked few-branched rosette-hairs the cells of the branches vesicular, some hairs with longer branches interweaving and forming the suède-like scintillating surface, others with shorter branches more or less overlapped, the contrast between the glistening brown upper and the mat scintillating yellow-buff suède under surface of the leaf very marked ; petiole about 2 cm. long grooved above slightly tinted red or pink clad with a thin tomentose indumentum like the twigs. Inflorescence an umbel or very shortly racemose umbel 15-flowered (or more), rhachis brown-floccose under 1 cm. long ; inner bracts chartaceous oblong-obovate approaching 2 cm. long pubescent ; bracteoles filiform slightly widened to top as much as 1.2 cm. long shorter than pedicels pilose from base hair-crested ; pedicels 2–2.5 cm. long, strict thin floccosely pubescent eglandular. Calyx small fleshy about 2 mm. long glabrous outside 5-lobed ; lobes ovate or rounded about 1.5 mm. long glabrous but for a few minute marginal flocks. Corolla funnel-campanulate about 4 cm. long white tipped-rose with a few crimson markings ; tube glabrous outside, puberulous inside not gibbous at base ; lobes 5 rounded emarginate some 1.8 cm. long 2.2 cm. broad. Stamens 10 unequal much shorter than corolla, longest about 2.5 cm. long with anther 3 mm. long, shortest about 1.5 cm. long with anther 2 mm. long ; filaments slightly widened downwards, above the base with a few minute hairs or practically glabrous. Disk finely puberulous below ovary. Gynaeceum about 3.5 cm. long shorter than corolla longer than stamens ; ovary thin about 6 mm. long cylindric grooved truncate glabrous the surface very finely papillate ; style glabrous hardly swollen below the lobulate narrow discoid stigma to which it furnishes a narrow lip.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 11,000 ft. Open pine forests. Shrub of 8–10 ft. Flowers

white tipped-rose with a few crimson markings. G. Forrest. No. 14,107. July 1917.

W.N.-W.-Yunnan. Mountains north of Atuntzu. Lat. 28° 35′ N. Alt. 14,000 ft. In open forests. Shrub of 12–16 ft. Flowers flushed rose with crimson markings. G. Forrest. No. 14,115. June 1917.

A species on the fringe of the Lacteum series with foliage recalling that of some of the East Asiatic species of oak now so much cultivated in our gardens. The exact position and the nearest relationships of *Rh. dryophyllum* are not yet certainly determined amongst the many forms of like conformation which Forrest has been collecting in N.W. Yunnan, and which have not yet been fully investigated. Its long narrow leaves, spreading, not deflexing, under the inflorescence, with their smooth scintillating persistent indumentum below of long and short branched hairs, the loose-trussed umbel, nearly glabrous stamens and glabrous ovary and style associated with the entire absence of glands, are notable characters of the species.

Forrest's specimen from "S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 30′ N. Alt. 13,000 ft. In open Rhododendron thickets. Shrub of 6–9 ft. Flowers? G. Forrest. No. 14,519. August 1917" is perhaps this species.

4800 **Rhododendron erastum,*** Balf. f. et Forrest.†

Small-leaved creeping undershrub some 7.5 cm. high with thin stems 3–4 mm. in diameter rooting freely showing short annual more or less woolly growths rarely over 2 cm. each

* *ἐραστός*, lovely—descriptive of its appearance.

† *Rhododendron erastum*, Balf. f. et Forrest.—Suffrutex repens vix 8 cm. altus ramis vix 3–4 mm. diam. lanatis et glandulosis radicantibus. Alabastrorum perulae extimae persistentes 4–5 lanceolatae acuminatae carinatae floccoso-ciliatae, intimae circ. 4 membranaceae spathulatae vel ligulato-spathulatae rubro-tinctae circ. 1 cm. longae; folia juvenilia revoluta supra dense floccosa. Folia petiolata ad 3.5 cm. longa; lamina crasse coriacea oblonga vel lanceolata ad 3 cm. longa 1 cm. lata anguste obtusa mucrone prominulo, margine revoluta, basi subtrunculata; supra opaca olivacea costa media venisque primariis (utrinque circ. 8) plus minusve sulcatis, pilorum vestigiis notata; subtus pallidior costa media venisque primariis elevatis venulis ultimis conspicue reticulatis, plus minusve floccoso-tomentosa et glandulosa; petiolus circ. 1 cm. longus lanatus. Flores in umbellas terminales 3–4-floras dispositi; bracteae persistentes, intimae membranaceae flavidae cucullatae; bracteolae laete flavae pilosae, pedicellis breviores; pedicelli circ. 1 cm. longi dense floccosi et glandulosi. Calyx parvus circ. 2 mm. longus; cupula extus floccosa; lobi 5 circ. 1 mm. longi deltoidei extus glabri floccoso-ciliati. Corolla campanulata circ. 2.2 cm. longa laete rosea; tubus extus glaber, intus paullo puberulus et septis interpetalinis incompletis divisus 5-gibbosus carneus; lobi 5 rotundati 7 mm. longi 1 cm. lati. Stamina 10 subaequalia corolla multo breviora; filamenta glabra. Discus puberulus. Gynaeceum corolla brevius staminibus longius circ. 1.8 cm. longum; ovarium petasiforme truncatum circ. 3 mm. longum dense floccosum et glandulis parvis paucis indutum; stylus glaber.

producing as many as 8 foliage-leaves which persist for several years and are clad with scale-leaves of the leaf-bud which persist for many years and closely clothe the stems. Branches of the year densely lanate with white long-stalked much-branched hairs covering an inconspicuous series of glands, the wool becoming rufous-brown and persisting for several years. Scale-leaves of the foliage-bud few outer ones some 4 or 5 lanceolate acuminate keeled often pink flock-fringed more or less, the tip particularly floccose the hairs rufous-brown, not crustaceous at expansion but becoming so, persistent at base of shoot; inner scale-leaves about 4 membranous spathulate or ligulate-spathulate acute or mucronulate pale yellowish tinged rose flock-fringed about 1 cm. long 2.3 mm. broad carried up on the elongating shoot; young leaf revolute in the bud, covered on upper surface with floccose soon deciduous hairs, underside densely lanately tomentose with a few short glands beneath the hairs; petiole densely whitely woolly. Leaves petiolate as much as 3.5 cm. long; lamina thickly leathery oblong or lanceolate as much as 3 cm. long 1 cm. broad, narrowly obtuse with a prominent projecting hydathodal mucro, margin revolute, base subtruncate or obtuse; upper surface olive-green opaque grooved over midrib, primary (about 8 on each side) and ultimate veins marked by traces of fallen juvenile hairs which persist more or less in withered state in groove of midrib; under surface paler the midrib and primary veins raised, reticulation of ultimate venation very conspicuous, on midrib and primary veins and about them a rufous-brown tomentum persists in tufts the hairs with very long pluricellular stalks and many interwoven branches, a few glands line the ultimate veins; petiole as much as 1 cm. long stout densely rufously lanate like the young stems. Flowers in 3–4-flowered terminal umbels sometimes reduced to 1 flower; bracts persistent during flowering, outermost crustaceous oblong with a long apiculus more or less floccose outside ciliate, innermost membranous yellow oblong-oval as much as 2 cm. long 9 mm. broad obtuse loosely pilose all over on both surfaces, glandular at the top inside, floccose-ciliate; bracteoles bright yellow linear-clavate acute about 6 mm. long shortly and sparingly pilose throughout without a hair-crest; pedicels about 1 cm. long densely floccose and glandular. Calyx somewhat fleshy saucer-shaped small about 2 mm. long 5-lobed; cup floccose outside; lobes about 1 mm. long deltoid red glabrous outside, floccose-ciliate. Corolla campanulate about 2.2 cm. long clear rose without spots or blotch; tube glabrous outside, slightly puberulous inside, 5-gibbous retuse fleshy at the base with 5 imperfect interpetaline septa; lobes 5 rounded about 7 mm. long 1 cm. broad slightly

emarginate. Stamens 10 subequal, 5 a little shorter than other 5, much shorter than corolla, longer about 1.2 cm. long with anther 1.5 mm. long, shorter about 1 cm. long with anther 1 mm. long; filaments widened to base, puberulous in lower half. Disk puberulous. Gynaeceum about 1.8 cm. long a little shorter than corolla much longer than stamens; ovary dome-shaped truncate grooved about 3 mm. long densely floccose with white hairs which become rufous-brown, intermixed are some stalked ovoid glands; style glabrous slightly clavate at top and forming a narrow bright red lip to the discoid lobulate stigma.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 14,000 ft. On stony alpine meadows. Creeping shrub of 2–3 inches. Flowers clear-rose without markings. G. Forrest. No. 14,373. July 1917.

One of the best of the dwarf alpine Rhododendrons discovered by Forrest, rivalling in claims its ally *Rh. Forrestii*, Balf. f.

It seems to be a looser-branched plant than *Rh. Forrestii*, spreading a little more and forming slightly longer shoots, and is easily distinguished by several conspicuous characters, of which may be named:—the leaves are oblong or lanceolate, not obovate or elliptic, and have a rufous-brown under-leaf tufted tomentum along the veins; the branchlets are woolly with a few glands beneath not merely glandular; the flowers are in 3–4-flowered umbels occasionally reduced to one flower not normally solitary, and are about half the size of those of *Rh. Forrestii*; the corolla is a clear-rose, not deep crimson; the staminal filaments are puberulous. We have no fruiting specimens of the species, which is a desirable plant for cultivation.

Rhododendron eudoxum,* Balf. f. et Forrest.†

Shrub barely 2 m. high with twiggy thin branches about 2 mm. in diameter when a year old, not conspicuously

* *εὔδοξος*, of good report—in allusion to its attractiveness.

† *Rhododendron eudoxum*, Balf. f. et Forrest.—Frutex vix 2 m. altus subvirgatus. Rami tenues, juveniles floccis glandulisque obtecti demum glabri cinerei subnodulosi. Alabastrorum perulae mox deciduae. Folia petiolata ad 7.5 cm. longa; lamina subcoriacea obovata ad 7 cm. longa 2.5 cm. lata, apice rotundata mucronata, margine cartilaginea plana, basi obtusa; supra olivacea laevis erugulosa glabrescens; subtus pallide flavido-viridis pilis floccosis siccis distantibus conspersa, costa media venisque primariis rubrotinctis elevatis; petiolus 5–7 mm. longus glabrescens. Umbella 5–6-flora; pedicelli ad 2 cm. longi floccosi glandulosi. Calyx ad 7 mm. longus fere ad basim 5-lobus; lobi rubri inaequales membranacei elliptici vel oblongo-elliptici, apice rotundati vel obtusi, extus glabri, margine floccosi et glandulosi. Corolla tubuloso-campanulata ad 3.5 cm. longa roseo-kermesina sparsim maculata glabra; lobi 5 rotundati emarginati. Stamina 10 inaequalia corolla breviora; filamenta puberula. Discus puberulus. Gynaeceum corollam subaequans; ovarium ad 4 mm. longum cylindricum truncatum sulcatum glandulosum et floccosum; stylus glaber.

nodular and without a covering of persistent scale-leaves of the foliage-buds, showing short annual growths at most about 2 cm. long bearing rosulate clusters of some 5 leaves, at first reddish soon becoming grey, bearing vestiges of floccose vesicular branched hairs and of stalked ovoid glands. Leaf-bud narrow fusiform pointed, scale-leaves early deciduous; outer scale-leaves crustaceous rounded about 5 mm. long and broad, with a tail or apiculus, followed by longer oblong or oval mucronate ones, all keeled outside puberulous with floccose hairs the hairs clustered densely round the apiculus, margin floccose-ciliate; inner scale-leaves yellow membranous ligulate-spathulate about 2 cm. long 6 mm. broad rounded shortly mucronulate, silkily puberulous inside, densely floccose around the mucro, outside puberulous, margin ciliate; young leaves revolute in the bud sparingly floccose on upper surface densely so and glandular over lower surface of petiole and base of lamina. Leaves petiolate as much as 7.5 cm. long; lamina thinly leathery obovate or oblong-oval as much as 7 cm. long 2.5 cm. broad, apex rounded with a short red tuberculate projecting mucro, margin cartilaginous plane, base obtuse; upper surface mat dark olive-green smooth not rugulose or shagreened glabrescent with a grooved midrib, the primary veins some 12 on each side not conspicuous, the midrib lined by withered floccose hairs vestiges of which are seen over the general surface; under surface paler yellow-green with slightly red-tinted raised midrib and primary veins, the midrib densely floccose with hair vestiges, the general reticulum of venation seen through a thin veil of a more or less withered indumentum composed of floccose distant whitish branched vesicular rosulate hairs, eglandular; petiole 5–7 mm. long grooved pinkish showing more or less withered floccose hairs and stalks of glands. Flowers in a terminal 5–6-flowered umbel; bracts and bracteoles falling as flowers open; pedicels equal about 2 cm. long thin strict divaricate swollen below the calyx densely clad with fasciately branched floccose hairs intermixed with short setulose ovoid red glands. Calyx subfoliaceous about 7 mm. long with a short fleshy cup and 5 red membranous lobes; cup glandular and floccose outside about 1 mm. long; lobes unequal all elliptic or oblong-elliptic obtuse or rounded at top, the larger as much as 6 mm. long 4 mm. broad glabrous outside, gland- and floccose-ciliate, the smallest about 2 mm. long, the lobes usually spreading at first fall from the cup so that in older flowers the notched cup rim appears like the whole calyx. Corolla " deep clear crimson rose " (Forrest), sparingly spotted tubular-campanulate about 3.5 cm. long; tube fleshy at base 5-gibbous with imperfect interpetaline septa inside, the gibbosities deeper coloured, glabrous outside and

inside; lobes rounded about 1.5 cm. long 1.8 cm. broad emarginate. Stamens 10 unequal shorter than corolla, longest about 2.5 cm. long with anther 3 mm. long, shortest about 1.5 cm. long with anther 2 mm. long; filaments dilated downwards finely puberulous at very base. Disk finely puberulous below ovary. Gynaeceum nearly equalling in length the corolla much longer than stamens; ovary about 4 mm. long cylindric truncate grooved densely clad with short setulose ovoid glands mixed with a few fasciate floccose hairs; style glabrous stout clavate below the broad lobulate stigma to which it forms a narrow lip.

N.W. Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 11,000 ft. In open Rhododendron thickets. Shrub of 6 ft. Flowers deep clear crimson rose with few markings. G. Forrest. No. 14,245. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 40′ N. Alt. 13,000 ft. In open thickets and Rhododendron scrub. Shrub of 3 ft. Flowers deep magenta rose. G. Forrest. No. 16,711. July 1918.

Rh. eudoxum is one of those bright-flowered small shrubs like *Rh. sanguineum*, Franch. and its allies, of which N.W. Yunnan has furnished so many. It is a larger plant than most of the members of the Sanguineum series, and differs from them conspicuously in wanting the white or buff-coloured under-leaf surface which is so characteristic of them. The compact though thin indumentum which gives the surface-effect is not developed in *Rh. eudoxum*, where the under-leaf surface is pale yellowish-green and bears a thin veil of distant dried-up rosette-hairs only. Casual observation might suggest that the leaf-surface is glabrous, but careful looking will reveal the existence of the very slight coating which slightly obscures the green epidermal cells beneath. Other characters of *Rh. eudoxum* are those of a typical member of the Sanguineum series. Its mode of growth is the same—by short annual increments producing rosulate groups of leaves at the end of the shoots, and with a tendency to thickening of this area of the annual growth so that the branch becomes more or less nodulose. Here the scale-leaves of the bud always fall early, and do not coat the stems as in some of the Sanguineum series. Then the calyx with deciduous membranous lobes, the tubular-campanulate corolla with basal imperfect interpetaline septa, the floccose-glandular ovary and glabrous style are also characters of the Sanguineum series. We must look upon *Rh. eudoxum* as a member of the series aberrant in its leaf-indumentum.

4802

Rhododendron flavorufum,* Balf. f. et Forrest.†

Shrub of 1–1.5 m. high with many short stout branches eglandular in all its parts. Branches from the first quite glabrous becoming red not decorticating for several years. Outer scale-leaves of the foliage-bud crustaceous ovate keeled cucullate mucronulate glabrous outside, puberulous inside at top silky, margin ciliate; innermost scale-leaves ligulate-spathulate acuminate about 3 cm. long 3 mm. broad membranous yellow, ciliate otherwise glabrous; young leaves revolute densely floccose above with white detersile long-branched hairs, the branches cylindric intercurled, underneath yellow and densely covered by an indumentum of stout hairs with short stem and straight agglutinate branches forming a continuous stratum—the coloration apparently due to wax. Leaves petiolate variable in length from 6 cm. to 14 cm.; lamina chartaceous oval or elliptic or oblong-oval, varying from 4.5 cm.–12.5 cm. long 2.5 cm.–6 cm. broad, apex rounded or broadly obtuse with a very short mucro, margin flat broadly cartilaginous tinted yellow or red, base rounded or cordulate; upper surface dark green at first somewhat glossy then mat and faintly shagreened (in dry state) glabrescent but showing vestiges of juvenile floccose hairs more or less, midrib grooved and lined by withered hairs, primary veins about 12 on each side conspicuous; under surface at first covered all over by a pale yellow membranous pellicle of indumentum composed of hairs with short stem and broad branches agglutinated and clad with wax, later rufous-brown and covered with pimple-like red detersile patches of agglutinate indumental hairs all infiltrated with red secretion, the patches

* *flavorufum*—in allusion to the change of colour of indumentum.

† *Rhododendron flavorufum*, Balf. f. et Forrest.—Frutex ad 1.5 m. altus eglandulosus ramis plurimis brevibus. Ramuli glabri erubescentes. Perulae intimae ligulato-spathulatae acuminatae ciliatae caeteroquin glabrae; folia juvenilia revoluta, supra pilis detersilibus dense induta, subtus indumento continuo vestita. Folia petiolata ad 9 cm. longa; lamina chartacea ovalis vel elliptica vel oblongo-ovalis circ. 3.5 cm. lata apice rotundata vel late obtusa, margine cartilaginea plana, basi rotundata vel cordulata; supra atro-viridis glabrescens pilorum juvenilium vestigiis plus minusve notata, costa media sulcata; subtus costa media elevata, primo pallide flava indumento continuo membranaceo e pilis agglutinatis constructo vestita, dein rufo-brunnea indumenti pannis detersilibus plurimis pustulosa, intervallis rufo-viridibus et vestigiis pilorum obsitis, demum glabra; petiolus infra glaber primo superne floccosus demum glabrescens circ. 1 cm. longus. **Flores** in umbellam breviter racemosam 8–10-floram dispositi, rhachi glabra; bracteae intimae obovatae utrinque sericeae; bracteolae filiformes circ. 7 mm. longae; pedicelli inaequales 1.5–2 cm. longi glabri. Calyx parvus carneus glaber 5-dentatus. Corolla alba sparsim kermesino-maculata infundibuliformi-campanulata circ. 3 cm. longa, intus dense puberula, 5-loba; lobi rotundati. Stamina 10 inaequalia corolla gynaeceoque breviora. Discus glaber. Gynaeceum circ. 2.7 cm. longum corolla brevius, staminibus longius; ovarium glabrum circ. 4 mm. longum; stylus glaber.

formed by the splitting up of the original pellicle, the intervals between the patches brownish-green showing the epidermis below a thin hair-coating formed of bases of the pellicle hairs which have been torn off to form the rufous patches, in the end reddish blotched green and glabrous owing to fall of all indumentum but vestiges of hairs remain, midrib raised clad like the rest of the surface; petiole about 1–1.5 cm. long glabrous underneath from the beginning, above at first densely clad with floccose indumentum glabrescent sometimes reddened. Inflorescence a shortly racemose 8–10-flowered umbel, the rhachis about 5 mm. long glabrous; outer bracts from rotundate to ovate or oblong-oval keeled concave, the outermost shortly tailed, silky inside glabrous outside, except at the tail which is tomentose with wrinkled greasy rufous hairs, more or less ciliate, inner bracts silky on both sides as much as 1.5 cm. long 1 cm. broad, innermost fertile bracts obovate or shortly spathulate rounded at top and often crimson there silky inside and outside as much as 2 cm. long and over 1 cm. broad; bracteoles filiform pilose from base about 7.5 mm. long shorter than pedicels; pedicels unequal 1.5–2 cm. long green glabrous. Calyx small fleshy saucer-shaped glabrous about 1 mm. long with 5 minute teeth. Corolla funnel-campanulate white with a few crimson posterior spots about 3 cm. long closely puberulous inside towards base, glabrous outside not gibbous 5-lobed; lobes rounded emarginate about 1 cm. long 1.5 cm. broad. Stamens 10 unequal much shorter than corolla and gynaeceum, longest about 2.2 cm. long with anther 3 mm. long, shortest about 1 cm. long with anther 2 mm. long; filaments widening downwards, from the base all villous to the middle or beyond. Disk glabrous. Gynaeceum about 2.7 cm. long shorter than corolla longer than stamens; ovary conoid truncate glabrous about 4 mm. long; style glabrous slightly clavate at tip and forming a lip to the narrower lobulate stigma. Capsule slightly oblique to pedicel obovoid or oblong-ovoid glabrous black nearly straight about 1.7 cm. long 5 mm. in diameter dehiscing by 5 valves from the apex leaving a short stylopod around base of persistent style. Seeds pale chestnut-brown about 2 cm. long 1 cm. broad, complanate oblong without wings blunt at both ends, sometimes prolonged slightly at chalazal end, without terminal arils.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 20′ N. Alt. 14,000 ft. On cliffs and rocky slopes. Shrub of 3–5 ft. Flowers soft rose with a few crimson markings. G. Forrest. No. 14,345. July 1917; on cliffs. Shrub of 2–5 ft. Foliage only. G. Forrest. No. 14,341. July, 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween

divide. Lat. 28° 25′ N. Alt. 14,000 ft. Open rocky slopes and on the margins of pine forests. Shrub of 2–4 ft. Flowers rose. G. Forrest. No. 14,368. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 30′ N. Alt. 12,000–13,000 ft. Open rocky slopes. Shrub of 4–6 ft. Flowers white, flushed rose exterior, without or with very few markings. G. Forrest. No. 14,732. Aug. 1917.

S.E. Tibet. Tsarong. G. Forrest. Nos. 14,776, 14,786. Sept. 1917. Duplicate in fruit.

S.E. Tibet. Tsarong. G. Forrest. No. 14,799. Duplicate in fruit.

W.N.-W.-Yunnan. G. Forrest. Nos. 14,802, 14,806. Sept. 1917. Duplicate in fruit.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 30′ N. Alt. 14,000 ft. On open rocky slopes. Shrub of 6–10 ft. In fruit. G. Forrest. No. 14,810. Sept. 1917.

The striking feature of this Rhododendron is its indumentum on the leaf under surface. In the bud both surfaces of the leaf are densely clad by hairs. Those on the upper surface are beautifully shaped flocks having a definite stalk; from its base upwards proceed long unicellular thick-walled pointed branches curling and more or less interlocking with those of neighbouring hairs. As the leaf unfolds these flocks fall off, a few withered vestiges remaining. The lower indumentum is composed of two kinds of hairs, some—fewer—like those of the upper surface, others with thin-walled septate vesicular branches which are agglutinate almost from the first, and between which the thick-walled floccose hairs pass upwards. When the leaf expands these agglutinate hairs form a thin pellicle bright yellow in colour, apparently from a secretion of wax, and the pellicle is continuous over the whole under surface. But long before the leaf has reached adult size a remarkable change takes place in two directions. First of all in colour. The hairs change to a red-brown, as if infiltrated with a resin-like substance. Then the indumentum pellicle breaks up as the leaf extends into patches equally distributed over the surface of the leaf. So uniform is the size of the patches, although their outline is not so, and so uniform their distribution, that the phenomenon can hardly be accidental. The leaf-surface appears covered by reddish-brown scale-like patches separated by intervals in which the green leaf-tissue is visible thinly concealed by bases of hairs detached and held in the agglutinate scale-like patches. These scale-like patches seem to dry up and are separable from the leaf. In older leaves they

may fall off, as do the hair-bases on the intermediate areas, and the leaf becomes quite glabrous.

A character of attunement having a development such as has been described may be expected to show arrests or exacerbations in relation to environmental conditions, and the long series of specimens which Forrest has collected exhibit the indumentum-character in various stages. In some of the specimens the young leaves with yellow indumentum do not appear, possibly because of the stage of development of the plant from which they were plucked; in others the indumentum becomes bright brown, not dark red, or it is only buff-coloured. In what I have described as the typical form the agglutinate patches of indumentum after it splits appear as so many "scabs" on the surface, and give it a by no means attractive look, but in other cases the splitting proceeds in undulate lines along the long axis of the leaf, giving the surface an areolate aspect without reaching the stage of isolation of the agglutinate patches. In some specimens the indumentum, so long as it is in the yellow stage, is continuous and unsplit, in others it is split at this stage. The difference between the appearance of the leaves in typical cases where the scab-like patches are well developed and cases in which there are only a few undulate lines of splitting is very conspicuous, and when these forms of splitting are associated with long and short leaves respectively, or with broad and narrow leaves, the question of specific identity of the forms naturally arises, particularly when, as in so many of the specimens that have been collected, only foliage or foliage with fruit is shown. I believe that they all belong to one species, and that the variation in leaf-size and indumentum-splitting is to be attributed to climatic conditions of the habitat. Forrest's opinion upon this we should much like to have. He has called attention to the foliage-character of the plant as giving it value horticulturally.

There is no doubt about the affinity of this remarkable Rhododendron. It belongs to the Taliense series, which includes eglandular forms with elliptic or oval or oblong-oval thick fleshy leaves showing rounded or cordulate base and a dense tomentose bistrate under-leaf indumentum often agglutinate in its upper stratum, usually persistent—but here splitting and often shed in agglomerate scale-like patches—small calyx, campanulate or funnel-campanulate 5-lobed (sometimes more) corolla, 10 (sometimes more) stamens with hairy filaments, a glabrous ovary and glabrous style. *Rh. taliense*, Franch., was the first described species of the series, and it seems to be unknown outside the Tali Range in Mid West-Yunnan. In 1913 Forrest brought from the Chungtien plateau, in the east of N.W.

Yunnan, *Rh. Clementinae*, Forrest et W. W. Sm., a large-leaved form with 7 corolla-lobes and 14 stamens. In the same year Kingdon Ward discovered *Rh. aganniphum*, Balf. f. et Ward, on Ka-gwr-pw and Doker-la in the Tsarong of S.E. Tibet. Now Forrest's exploration of S.E. Tibet and the adjacent area of Western North-West Yunnan shows that the series is represented by other species in that region, and *Rh. flavorufum* is one of them. On p. 131 will be found a description of *Rh. schizopeplum*, Balf. f. et Forrest, from the Mekong-Salween divide, a form with splitting indumentum but on different lines from that of *Rh. flavorufum*. And there are others yet to be described. The series is widespread apparently, but of all the forms known no one exhibits features of indumentum so remarkable as those from which *Rh. flavorufum* takes its name.

4803 **Rhododendron Griersonianum,*** Balf. f. et Forrest.†

Shrub about 2 m. high with stiff straight gland-setulose and tomentose branchlets, petioles, and pedicels. Branchlets a year old as much as 4 mm. in diameter densely clad with a bistrate indumentum of long brown setae ending in an ovoid dark-red gland (not sticky in dry state) forming an upper stratum, and dendriform much-branched hairs with brown pluricellular stem and long-branched interwoven white branches forming a lower stratum, setae and hairs more or less persistent for a year or two, then falling and leaving wart-like traces on the brownish or grey bark. Foliage-buds acute spinescent at apex; outermost scale-leaves elongated triangular obtuse glabrous glossy inside, tomentose outside, ciliate; inner scale-leaves narrow somewhat ensiform rigid, traversed by several veins tapering to a long somewhat spine-like subulate tip glossy inside, tomentose outside, ciliate, conduplicate convolute; young leaves revolute in bud. Leaves petiolate as much as 18 cm. long distributed along the twigs not aggregated at the

* Named in compliment to R. C. Grierson, Esq., of the Chinese Maritime Customs at Tengyueh, whose help I gratefully acknowledge.—G. FORREST.

† *Rhododendron Griersonianum*, Balf. f. et Forrest.—Frutex ad 2 m. altus. Ramuli stricti recti cum petiolis pedicellisque glanduloso-strigillosi et tomentosi. Alabastrorum perulae subspinescentes. Folia elongato-lanceolata angusta ad 18 cm. longa 5 cm. lata acuminata basi obtusa, supra opaca plana tomenti vestigiis et setularum pedibus rubris punctata, subtus fulva tomento detersili induta, costa media subtus prominula venulis primariis utrinque occultis; petiolus ad 3 cm. longus. Flores 5–6 in racemum umbellatum terminalem dispositi, laete rosei et maculati, fragrantes. Calyx parvus. Corollae laete roseae extus tomentosae ad 6.5 cm. longae limbus infundibuliformi-campanulatus 5-lobatus, tubus elongatus cylindricus ad 2 cm. longus. Stamina 10 corolla breviora inaequalia; filamenta a basi minutissime puberula. Discus puberulus. Gynaeceum corollam subaequans; ovarium dense spadiceo-tomentosum et glanduloso-setulosum; stylus glaber supra basim minutissime puberulus; stigma latum atro-rubens lobulatum.

summit; lamina leathery usually narrowly elongated lanceolate some 12 cm. long and 3 cm. broad but sometimes longer and broader up to 16 cm. and 5 cm. broad, acute or shortly acuminate with a conspicuous red horny hydathodal mucro, margin slightly recurved cartilaginous entire, base obtuse; upper surface pale mat green flat not shagreened apparently glabrous but showing vestiges of an early tomentose indumentum, punctulate with the red bases of fallen setae, midrib slightly grooved, primary veins as many as 12–14 on each side hardly visible; under side buff-coloured entirely covered by a unistrate tomentose indumentum of dendriform hairs with long many-celled brown stalks spreading into many long branchings of cylindric cells which become densely interwoven but never agglutinate, indumentum detersile exposing a bright green leaf-surface, midrib prominent also tomentose, rest of venation hidden; petiole grooved above 2–3 cm. long densely tomentose and setulose the setulae often extending along the margin to the base of the leaf. Flowers few (5–6) in a terminal umbellate raceme; rhachis about 2 cm. long rufous-brown glandular-setose and tomentose; outer sterile bracts unknown, inner oblong-oval or oval tapered into a long acuminate stiff tip, about 3.5 mm. long tail longer than the base of the bract, tomentose outside, silky inside, innermost fertile bracts oblong cucullate about 5 cm. long 1.8 cm. broad thin membranous with many converging veins long apiculate or tailed, tail much shorter than body of bract outside and inside more or less silky; bracteoles about 2 cm. long 1.5 mm. broad somewhat vaginate at base narrowly ligulate, throughout hairy with dendriform hairs hair-crested; pedicels stout about 4 cm. long set on oblique to axis of flower densely gland-setulose and tomentose with dendriform hairs. Calyx small densely setulose and tomentose; cup with 5 short oblong similarly clothed teeth. Corolla about 6.5 cm. long bright rose spotted darker posteriorly as much as 6.5 cm. long with a cylindric tube and funnel-campanulate limb, outside tomentose with fasciately branched hairs; tube as much as 2 cm. long thick 5-gibbous at base inside puberulous, expanding into the 5-lobed limb; lobes rounded about 2 cm. long 2.5 cm. broad. Stamens 10 shorter than corolla unequal, longest about 5.5 cm. long with oblong anther 4 mm. long, shortest about 4.5 cm. long with anther 3.5 mm. long; filaments flattened and wider at base, finely puberulous from very base through three-quarters or more of length. Disk finely puberulous. Gynaeceum about equal to corolla; ovary conoid truncate about 5 mm. long grooved densely covered with adpressed fasciately-branched brown hairs intermixed with short glandular setulae which form a crest at

top concealing base of style; style at base where concealed clad with a few hairs otherwise glabrous bright red expanded at top and forming a conspicuous lip below the dark black-red lobulate broad discoid stigma.

W. Yunnan. Shweli-Salween divide, Shweli Valley. Alt. 9000 ft. Lat. 25° 20′ N. Open situations in pine and mixed forests. Shrub of 5–7 ft. Flowers bright rose, fragrant. G. Forrest. No. 15,815. June 1917.

A species with a distinguishing corolla. The long cylindric tube below the abruptly open limb shows no obliquity, and is densely hairy outside. It recalls in form that of the Oxypetalum series, but the plant is no near relation of that series. Where it should be placed I am unable at the moment to determine.

4804

Rhododendron haemaleum,* Balf. f. et Forrest.†

Small undershrub about 5 dm. high with thin straight short branches about 2 mm. in diameter when a year old, not clothed with persistent scale-leaves, showing more or less for a year or two the vestiges of a juvenile indumentum of floccose hairs, bearing leaves in rosulate clusters of 5–6 at end of each year's shoots which become tumid and make the older branches more or less nodulose, leaves not persisting through a second year, bark becoming a dark grey before decortication. Outer scale-leaves of the foliage-bud leathery rounded below apiculate or shortly-tailed keeled pubescent with adpressed floccose hairs outside, sericeous at top inside, margin erose and

* *αἱμαλέος*, blood-red—in allusion to the colour of the flower.

† *Rhododendron haemaleum*, Balf. f. et Forrest.—Suffrutex nanus ad 5 dm. altus. Rami breves tenues stricti indumenti juvenilis vestigiis plus minusve notati ad apicem folia 5–6 rosulatim gerentes, plus minusve nodosi. Alabastrorum perulae extimae mox deciduae crustaceae apiculatae, intimae vix 1.6 cm. longae 3 mm. latae membranaceae ligulato-spathulatae; folia juvenilia revoluta supra floccosa pilis caducis. **Folia ad 9 cm. longa; lamina crasse coriacea oblanceolata** vel oblonga vel obovata vel oblongo-obovata ad 8 cm. longa 2.5 cm. lata ad apicem obtusa vel rotundata, **basi in petiolum subalatum attenuata; supra** olivacea rugulosa glabrescens sed pilorum vestigiis praecipue in sulco costae mediae notata; infra albida costa media erubescente prominula indumento tenui persistenti laevi induta; petiolus ad 1 cm. longus saepe brevior glabrescens. Umbella terminalis 3–5-flora; bracteae sub anthesi deciduae, intimae subchartaceae extus intusque sericeae; bracteolae ad 1.2 cm. longae; pedicelli tenues inaequales ad 2.5 cm. longi dense floccoso-pubescentes eglandulosi. Calyx conspicuus circ. 3.5 mm. longus; cupula atro-coccinea pubescens; lobi 5 circ. 2 mm. longi coccinei ovati vel oblongi obtusi extus glabri margine floccoso-ciliati demum reflexi et decidui. Corolla atro-coccinea carnea campanulata circ. 2.8–3 cm. longa; tubus intus basi septis incompletis interpetalinis divisus omnino glaber; lobi 5 patentes rotundati emarginati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta albida basi puberula. Discus glaber. Gynaeceum corolla paullo brevius staminibus paullo longius; ovarium circ. 3.5 mm. longum cylindrico-conoideum truncatum pilis fasciatis rufescentibus dense tomentosum eglandulosum; stylus glaber.

floccosely ciliate; innermost scale-leaves ligulate-spathulate shortly acuminate or acute or erose with an apiculus in the sinus membranous yellow with conspicuous midrib as much as 1.6 cm. long 3 mm. broad ciliate with long branched hairs, at the top and about the apiculus densely clad with rufous floccose hairs, more or less sericeous inside; young leaves revolute, covered on the upper surface with soft floccose white hairs with few branches falling as the leaf expands. Leaves petiolate as much as 9 cm. long usually less; lamina thickly leathery oblanceolate or oblong or obovate or oblong-obovate as much as 8 cm. long 2.5 cm. broad commonly much less, apex obtuse or somewhat rounded ending in a prominent hydathodal dark red mucro, margin cartilaginous slightly recurved, base tapered and forming a slight wing to the petiole; upper surface dark olive-green rugulose slightly shagreened glabrous but with vestiges of fallen hairs particularly in the groove of midrib, primary veins (some 14 in longer leaves, 8–10 in shorter) and a few secondary veins grooved; under surface grey-white the glabrescent midrib (a few floccose hairs occur) prominent red-tinted, the primary veins slightly prominent ascending with a curve at an acute angle covered as is whole surface by a compact not markedly detersile indumentum forming a smooth scintillating surface and composed of shortly-stalked hairs dividing at the top of stalk into many horizontal branches of wide cells spreading laterally and interweaving but not agglutinating forming a canopy over the epidermis—some of the hairs have very short stalks and suggest a second stratum of the indumentum but I do not see that they truly form one; petiole in long leaves 1 cm. in shorter about 5 mm. long glabrescent but with vestiges of juvenile adpressed branched indumental hairs grooved above, groove more or less open. Flowers in 3–5-flowered terminal umbels; outermost bracts like those of foliage-bud, followed by orbicular crustaceous bracts with an apiculus and more or less whitely pubescent outside, erose and ciliate, innermost bracts oblong-obovate or broadly spathulate about 1.2 cm. long 5 mm. broad somewhat chartaceous retuse at apex with an apiculus or mucro in the sinus sericeous outside and slightly so inside at the top, finely ciliate with white hairs below, clad with compact rufous hairs around the apex; bracteoles filiform slightly widened at top pilose from base and white hair-crested as much as 1.2 cm. long sometimes as long as the pedicel; pedicels slender unequal divaricate straight expanding below the calyx as much as 2.5 cm. long often only 1.2 cm. more or less pubescent with floccose spreading fasciate hairs, eglandular. Calyx conspicuous cupular about 3.5 mm. long; cup dark black-crimson densely floccose tomen-

tose ; lobes broadly ovate or oblong-obtuse about 2 mm. long bright red glabrous outside, floccose-ciliate reflexing and ultimately falling. Corolla "black-crimson," fleshy tubular-campanulate about 2.8 cm. (sometimes 4 cm.) long ; tube 5–gibbous at base imperfectly septate within, glabrous inside and outside expanding into a spreading limb with 5 lobes ; lobes rounded emarginate and crenulate about 1.2 cm. long and broad. Stamens 10 unequal shorter than corolla, longer about 2.4 cm. long with dark brown oblong anther about 3.5 mm. long, shorter about 1.3 cm. long with anther about 3 mm. long ; filaments white slightly widened to a darker-coloured base faintly puberulous over 2 or 3 mm. from the base. Disk glabrous. Gynaeceum about 2.6 cm. long in smaller flowers, a little shorter than or about equal to corolla ; ovary about 3.5 mm. long cylindrico-conoid grooved densely tomentose with indumentum of stout thick-stemmed floccose fasciate hairs with thick-walled cylindric pointed branches, stalks somewhat rufescent, eglandular ; style glabrous throughout expanding into the discoid lobulate slightly lipped stigma.

S.E. Tibet. Mekong-Salween divide, N.W. from Tzeku. Lat. 28° 15′ N. Alt. 11,000 ft. Open rocky situations in side valleys. G. Forrest. No. 5073. Aug. 1904.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 20′ N. Alt. 13,000 ft. Open rocky moorland. Shrub of 2 ft. Flowers black crimson. G. Forrest. No. 14,166. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 12,000 ft. In Rhododendron scrub on the margins of forests. Shrub of 2–4 ft. Flowers black crimson. G. Forrest. No. 16,736. July 1918.

Its dark crimson flower—"black-crimson" Forrest calls it —makes *Rh. haemaleum* one of the most striking species of the many new Rhododendrons obtained by Forrest during his explorations, and, introduced to cultivation, it should influence in no ordinary degree race-development within the genus.

Forrest first found it in 1904 in the region N.W. of Tzeku, and it came to this country as a small fragmentary specimen—saved from the collections of that year destroyed by the Lamas, —one of several beautiful new plants in like case which we are only now getting to know better through Forrest's present explorations. I do not think it can have been found by any of the French missionaries who collected in the vicinity of Tzeku before Forrest tapped the region. At least I did not see any specimens of it at Paris in 1906, and I hesitated to name Forrest's small specimen. Diels, however, named it *Rh. sanguineum*, and under that name it appears in Plantae

Chinenses Forrestianae.* But it is not Franchet's *Rh. sanguineum* as that appears in Soulié's plant under No. 1015, of which we have specimens for which I am indebted to M. Lecomte of the Paris Herbarium, though it belongs to the same phylum. Its marks of recognition are: first of all the dark colour of the corolla and the larger typically oblanceolate leaves; in addition, it has much smaller buds and scale-leaves covering them, leaves more rugulose above, fewer-flowered umbels, smaller bracts, stamens with white puberulous not glabrous filaments.

Rh. sanguineum is only briefly diagnosed by Franchet. I translate here what he says:—

Rhododendron sanguineum, Franch.,† in Journ. de Bot., xii (1898), 259.

"Leaves most shortly petiolate obovate or oblong-obovate, 4–6 cm. long 2–2.5 cm. broad rounded at the apex and mucronate opaque above glabrous clad beneath with a very thin white stratum. Flowers 6–10 loosely congested blood-red, pedicels unequal 2–3 cm. long shortly and loosely lanuginose. Calyx-lobes scarcely developed. Corolla 3–3.5 cm. long campanulate, 5-lobed. Stamens 10 shorter than corolla with glabrous filaments. Ovary rufously lanate; style glabrous; stigma capitate thick.

"Yunnan. Sela, between the Mekong and Salween. Soulié, 1015. June 20, 1895.

"Near *Rh. haematodes*, Franch., which it is very like in aspect. It differs, however, in—

"The leaves without tomentum beneath even when young.

"The calyx, of which the lobes are not developed.

* Notes, R.B.G. Edin., vii (1912), 296.

† Franchet's description runs:—

Rh. sanguineum, Franch.—Folia brevissime petiolata, obovata vel oblongo-obovata, apice rotundata cum mucronulo, supra opaca, glabra, subtus strato tenuissimo albo vestita, 4–6 cent. longa, 20–25 mm. lata; flores 6–10, laxe congesti, sanguinei, inaequaliter pedunculati, pedunculis 20–30 mm. longis, breviter et laxe lanuginosis; calycis lobi vix evoluti; corolla 30–35 mm. longa, campanulata, 5-loba; stamina 10, corolla breviora, filamentis glabris; ovarium rufo-lanatum, stylo glabro, stigmate capitato crasso.

Setchuen occidental, à Séla entre le Mékong et la Salouen, 20 juin 1895 (R. P. Soulié, n. 1015).

Voisin du *Rh. haematodes*, dont il a tout à fait l'aspect, il en diffère par son calice dont les lobes ne sont pas développés; par sa corolle à 5 lobes et ses étamines au nombre de 10; par ses feuilles dépourvues de tomentum en dessous, même à leur jeune âge.

La couche crustacée qu'on observe à la face inférieure des feuilles de quelques Rhododendron n'est souvent que le strate inférieur d'un véritable tomentum; mais dans le *Rh. sanguineum*, ainsi que dans le *Rh. lacteum* et quelques autres, l'indument laineux fait réellement défaut.

"The corolla, which has 5 lobes.

"The stamens, which are 10.

"The crustaceous layer which appears on the under-leaf surface of some Rhododendrons is often only the lower stratum of a true tomentum, but in *Rh. sanguineum* as well as in *Rh. lacteum* and some others the woolly indumentum is really absent."

In the specimens of Soulié's collecting which are in our herbarium there is not evidence of two characters of the inflorescence recorded by Franchet—the loosely congested flowers and the large number of flowers. As in all Forrest's specimens the flowers form an open spreading umbel and are never more than 3–4 in number in each umbel. The difference is not perhaps of importance.

More important is a criticism of the calyx-character given by Franchet. *Rh. sanguineum* and all its allies have a well-developed calyx, but the examination of dried material may easily mislead one to the belief expressed in "calyx-lobes scarcely developed," because the calyx-lobes are apparently deciduous or at least shrivel as the flower matures and are easily rubbed off, leaving only the calyx-cup with an irregular notching of its rim. This in default of specimens showing the history of development may fairly be described in Franchet's terms, for in dried specimens the recognition of the notches of the calyx-rim as scars of fallen lobes is difficult and at best somewhat uncertain. The material now supplied by Forrest of *Rh. sanguineum* and of its allies enables me to arrive at the correct interpretation of the construction, and establishes the calyx-character here as one of particular interest and value in the determination of phyletic relationships. The fact that in the note to his description Franchet uses the calyx-character as defined by him for one of the distinctions between *Rh. sanguineum* and *Rh. haematodes* does not vitiate the main point of the note—recognition of likeness to and of difference from *Rh. haematodes*. The calyx in the two species is very much the same in character, but the lobes appear to be generally persistent in *Rh. haematodes*. The calyx in *Rh. haematodes* shows considerable variation in size. Franchet gives * 5-8 mm. as the length in his type specimen. In 1887 he described † two varieties:—var. *calycinum* with a calyx 10-12 mm. long, and var. *hypoleucum* in which the calyx is almost 2 cm. long. In both varieties there is a tendency to incision of the lobes. These variations are of interest as developments parallel with those to which reference has been

* Franch. in Bull. Soc. Bot. Fr., xxxiii (1886), 232.

† Id. l.c. xxxiv (1887), 280.

made in the case of *Rh. dimitrum* and of *Rh. neriiflorum* (see p. 54).

The flower-character of difference between *Rh. sanguineum* and *Rh. haematodes* 5 petals, 10 stamens in the former, 6 petals 12 stamens in the latter, is not a valid one. Both species are characteristically pentamerous.

Where Franchet does furnish definite point for diagnosis is in the indumentum of the leaf underside. Here there is an easily recognisable difference, although fundamentally the indumentum in the two species is moulded on the same lines. I refer to this specially, because Franchet shows customary perspicacity in his appreciation of indumentum. The indumentum of *Rh. sanguineum* on the leaf underside forms a thin white covering smooth and scintillating. Under magnification the surface appears honeycombed by the interlacing of hairs spreading out more or less parallel with the plane of the leaf-surface; the whole surface is compact, there are no long hairs standing up like wool. The indumentum is formed of a series of shortly-stalked hairs, the stalks relatively stout and from the top giving off many horizontally spreading branches, the branches of adjacent hairs overlapping and interpenetrating, each branch being a thin-walled broad cell vesicular when mature. The branch-system forms a canopy over the leaf-surface supported as it were on pillars formed by the hair-stalks, and thus a chamber of still air, so important a contrivance for checking rapidity of transpiration, is provided. But these stalks are not all of quite the same length, and some of the hairs have stalks so short as to give them a different appearance from their neighbours with longer stalks. There is therefore an approach to a bistrate character in the indumentum, though it is not of the conspicuous well-marked character found in some other species of Rhododendron. But it is significant that in species very closely allied to *Rh. sanguineum*, for instance in *Rh. citriniflorum*, Balf. f. et Forrest (see p. 37), an emphatic development of the bistrate type occurs, and this may be regarded as a link between the less-developed state in *Rh. sanguineum* and the much more developed state in *Rh. haematodes*. For in *Rh. haematodes* a bistrate indumentum is typical. Its surface is buff-coloured, not white. No magnification is necessary to show its loose honeycombed surface, and if one does use a lens of even low magnifying power the long openly interwoven threads of the hair-branches stand out upon the surface in very different fashion from what is seen in *Rh. sanguineum*, and pressure with the finger of the surface in the two cases reveals to touch the soft resilient thick woolliness in *Rh. haematodes* in contrast with the hard unimpressible surface in *Rh. san-*

guineum. The construction in *Rh. haematodes* is this :—There are a number of hairs with long cord-like stems of many cells from which thin cylindric thick-walled ascending and divaricate branches proceed at intervals to the top, where are many, and these, particularly the topmost ones, become rufous-brown. These long-stemmed branching hairs interweave and form the loose upper stratum of indumentum. Attached to the epidermis between these are many short-stalked hairs with many branches radiating from the top of the stalk—the branches uncoloured, of broad thin-walled vesicular cells—and they form a lower stratum of indumentum. They are invisible under the upper stratum of the branched stems of the longer hairs. We thus have two quite distinct strata of the indumentum. There is no such development of an upper stratum in *Rh. sanguineum*, and this is what Franchet means when he says of *Rh. sanguineum* —"the leaves without tomentum beneath even when young." The tomentum, the woolly surface, in *Rh. haematodes* is formed by the upper stratum. The whole indumentum of *Rh. sanguineum* may be taken as the equivalent of the under stratum in *Rh. haematodes*. In *Rh. citriniflorum*, as has been stated, there is a beginning of the formation of an upper stratum. In no specimens of *Rh. haematodes* which have come under my observation does the upper stratum of indumentum fall off in the older leaves. The end branches of its hairs sometimes become matted together in part, and the surface network of hairs is obscured; that is all the change I have seen. There is not in *Rh. haematodes*, as happens in species with bistrate indumentum such as members of the Hodgsoni series, a removal of the usually coloured upper stratum as the leaf oldens, exposing the close usually grey under stratum. If there were we should get a leaf-surface like that of *Rh. sanguineum*. *Rh. sanguineum* shows what for purposes of contrast—though I express no opinion upon order of evolution—we may call a primary condition of one stratum of white compact hairs; *Rh. haematodes* shows a more developed condition of an upper stratum of looser tomentose hairs above a lower stratum, and both persist; *Rh. Hodgsoni*, Hook. f. shows an evolution of strata like that of *Rh. haematodes*, but the older leaves lose the tomentose upper stratum and expose the compact white under stratum and thus revert to the primary condition. This is the difference in construction of indumentum to which Franchet directs attention in the last paragraph of his note.

It should be borne in mind that *Rh. sanguineum* and *Rh. haematodes* are species which do not touch geographically. The latter is limited to the Tali Range and its vicinity about

lat. 25° 40′ N., long. 100° E., whilst *Rh. sanguineum* is a type of the Mekong-Salween divide in the extreme N.W. of Yunnan extending from Mount Sela in about lat. 28° N. to Ka-gwr-pw in about lat. 28° 35′ N. and around long. 98° E.

In view of the shortness of Franchet's diagnosis and the criticism of it introduced above it may be well, and conduce to a better understanding of likeness and difference, if I give here the following emended description of the species :—

Rhododendron sanguineum Franch., in Journ. de Bot., xii (1898), 259.

Small undershrub not 1 m. high, with thin straight short glabrous branches about 2.5 mm. in diameter when a year old bearing leaves in a rosette of 4–5 at the end of each year's growth, the leaves persisting for about 2 years but not always, the older stems not clad with persistent scale-leaves of foliage-bud, the branches soon becoming grey-white and decorticating in thin flakes. Foliage-buds oblong narrowly oval ; outer scale-leaves deciduous as bud opens crustaceous with a rounded or oblong base and a prominent apiculus or short tail rising from a truncate summit, keeled, outside along the middle shortly floccosely tomentose densely so around the apiculus and the hairs there brown, ciliate ; inner scale-leaves ligulate-spathulate narrow as much as 2 cm. long 4 mm. broad yellow with a brownish midrib membranous truncate or retuse at top with a short apiculus, glabrous outside, sericeous at top inside, floccose-tomentose around the apiculus, ciliate ; young leaves revolute in bud, floccose above, the hairs early deciduous. Leaves petiolate as much as 6 cm. long often less ; lamina leathery obovate or oblong-obovate or oval or narrowly oblong as much as 5.5 cm. long 2.5 cm. broad, rounded or obtuse at apex ending in a conspicuous hydathodal mucro, margin narrowly cartilaginous plane, base obtuse and slightly prolonged wing-like on the petiole ; upper surface dark green opaque glabrous but the midrib red-tinted groove showing some withered hairs ; primary veins some 10–12 on each side hardly visible or very slightly grooved, under surface grey-white with streaks of red marking the prominent midrib and primary veins, the surface covered with a thin skin of indumentum composed of shortly-stalked hairs which branch freely and their branches spreading outwards interweave to form a honeycombed somewhat scintillating surface but the hairs are not agglutinate, they form a canopy over the epidermis,—some shorter-stalked hairs amongst the shorter broader and more prostrate branches suggest a second stratum of hairs beneath the canopy but it is not well developed ; petiole red as much as 1 cm. long usually less,

when young densely tomentose glabrescent grooved above the groove somewhat open. Flowers in a 3–4-flowered terminal umbel; outermost bracts like the outer scale-leaves of the foliage-buds, these followed by broad orbicular crustaceous dark-brown bracts retuse at summit with an apiculus in the sinus outside and inside more or less sericeous the margin undulate somewhat erose with long cilia, innermost bracts yellow somewhat membranous oblong-oval cucullate densely sericeous outside and inside and densely ciliate; bracteoles linear-claviform about 5 mm. long yellow, from the base pilose white hair-crested; pedicels unequal, 1–3 cm. long stiff divaricate more or less densely floccosely woolly conspicuously swollen below the calyx. Calyx 2–3.5 mm. long; cup outside somewhat floccosely woolly; lobes about 1 mm. long bright red membranous ovate or rounded or semi-lunate glabrous outside, floccose-ciliate, at first adpressed to corolla, reflexing later and often deciduous. Corolla as much as 3.5 cm. long often less, widely campanulate bright crimson without spots or blotch; tube glabrous outside and inside fleshy below 5-gibbous retuse with faint interpetaline incomplete septa; lobes rounded 1.5 cm. long and 1.8 cm. broad emarginate crenulate. Stamens 10 subequal or conspicuously unequal shorter than corolla and gynaeceum, longest about 2.5 cm. long with anther 2.4 mm. long, shortest about 1.6 cm. long with anther 2 mm. long; filaments thin and slightly widened downwards, glabrous. Disk glabrous. Gynaeceum about 3 cm. long a little longer than stamens shorter than corolla; ovary about 4 mm. long cylindrico-conoid truncate densely woolly tomentose with rufous-brown reddening fasciately-branched long hairs and many short rosette-hairs beneath; style glabrous stout clavate and forming a lip under the broad lobulate discoid stigma.

W.N.-W.-Yunnan. Sela. Leaves white beneath. Flowers a shade of orange. Soulié, 1015. 25th June 1895; Soulié, 1015 bis. 13th July 1895.

S.E. Tibet. Mekong-Salween divide to the N.W. of Tzeku. Open rocky situations. Lat. 28° 12′ N. Alt. 12,000 ft. G. Forrest. No. 503. July 1904.

W.N.-W.-Yunnan. Tzeku. Monbeig. No. 168. 1897.

S.E. Tibet. Ka-gwr-pw Glacier valley. 13,000–14,000 ft. Granite screes. Dwarf. Kingdon Ward. No. 575. 27th June 1913.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 10′ N. Alt. 13,000 ft. Amongst scrub in open situations. Shrub of 3–4 ft. In fruit. G. Forrest. No. 13,304. Sept. 1914. In mature fruit. G. Forrest. No. 13,542. Oct. 1914.

N.W. Yunnan. On the Kari Pass. Lat. 28° N. Alt. 12,000 ft. Open pasture and on the margins of pine and Rhodo-

dendron forest. Shrub of 1–1½ ft. Flowers crimson scarlet. G. Forrest. No. 14,012. June 1917.

S.E. Tibet. On Ka-gwr-pw. Mekong-Salween divide. Lat. 28° 30′ N. Alt. 14,000 ft. Open rocky pasture. Shrub of 15–20 ins. Flowers deep crimson, almost black in bud. G. Forrest. No. 14,533. Aug. 1917 ?

Rh. sanguineum and *Rh. haemaleum* are allied plants of a phylum which appears to be widespread in N.W. Yunnan, and it shows, as we find so frequently in the West Chinese flora, several microforms bearing distinctive characters which compel us in the present state of our knowledge to use specific designations for the plants exhibiting them. In this paper appear the additional names *Rh. citriniflorum*, Balf. f. et Forrest, *Rh. cloiophorum*, Balf. f. et Forrest, *Rh. eudoxum*, Balf. f. et Forrest, *Rh. leucopetalum*, Balf. f. et Forrest, and *Rh. roseotinctum*, Balf. f. et Forrest, all of them of plants nearly allied to *Rh. sanguineum* —of its phylum—but yet differing from it. The whole of them are dwarf plants having relatively small thick foliage-leaves more or less rugulose above and with white indumentum below (excepting *Rh. eudoxum*); the stems frequently clad with persistent scale-leaves of the bud and often setulose; the flowers in usually few-flowered terminal umbels; the calyx with coloured lobes drying and often deciduous; the corolla some form of campanulate, fleshy and brilliantly coloured a tint of red or orange, often with interpetaline imperfect septa; the stamens shorter than corolla and gynaeceum with glabrous or puberulous filaments; the ovary tomentose and sometimes also glandular; the style a little shorter than corolla. The following key gives some of the diagnostic marks between them :—

Under-leaf surface yellow-green, with scattered floccose hairs.
  Scale-leaves of the foliage-buds falling at expansion.
    Pedicels and ovaries glandular.
      Filaments of stamens puberulous.
        Calyx-lobes membranous red glabrous on back, gland- and flock-fringed. Corolla tubular-campanulate dark rose . . *eudoxum.*

Under-leaf surface white, grey, or buff-coloured, completely covered by indumentum.
  Scale-leaves of the foliage-buds falling at expansion.
    Pedicels and ovaries eglandular.
      Filaments of stamens glabrous.
        Calyx-lobes fleshy dark-crimson floccose-ciliate. Corolla campanulate dark crimson . . . . . *sanguineum.*
        Calyx-lobes membranous yellow deciduous, floccose on back and floccose-ciliate. Corolla openly campanulate white . . *leucopetalum.*

Filaments of stamens puberulous.
Calyx-lobes fleshy dark-crimson floccose, pubescent on back and floccose-ciliate. Corolla tubular-campanulate dark black-crimson . . . . . *haemaleum.*
Pedicels and ovaries glandular.
Filaments of stamens puberulous.
Calyx-lobes setulose-glandular on back, gland-fringed. Corolla openly shallowly campanulate rose or creamy-white margined rose . . . . . *roseotinctum.*
Scale-leaves of the foliage-buds persistent after expansion.
Pedicels and ovaries eglandular.
Filaments of stamens glabrous.
Calyx-lobes yellow membranous deciduous, glabrous on back sparingly floccose-ciliate. Corolla tubular-campanulate rose . . *cloiophorum.*
Pedicels and ovaries glandular.
Filaments of stamens puberulous.
Calyx-lobes greenish membranous setulose-glandular and floccose on back, setulose-gland-ciliate. Corolla campanulate bright lemon-yellow (rose-coloured sometimes) . *citriniflorum.*

These plants are all dwarf alpines growing on ledges of cliffs or amongst boulders in open situations at elevations of 13,000–14,000 ft. north of 28° lat. The type occurs also further south, sometimes in plants of larger growth. To it belongs *Rh. neriiflorum*, Franch.—an aggregate seemingly which awaits analysis—with a centre of distribution on the eastern flank of the Tali Range, lat. 25° 40′ N., at elevations from 9000–11,000 ft., and another centre on the Shweli-Salween divide in lat. 25° 30′ N. at 10,000–11,000 ft. elevation. *Rh. dichroanthum*, Diels, represents it also on the eastern flank of the Tali Range at elevations of 9000–11,000 ft. in lat. 25° 40′ N. On the western flank of the Tali Range at 10,000 ft. in lat. 25° 40′ N. there is *Rh. dimitrum*, Balf. f. et Forrest, and further south comes *Rh. apodectum*, Balf. f. et W. W. Sm., at 10,000–11,000 ft. elevation in lat. 25° 30′ N. on the Shweli-Salween divide. On the Yung-peh Mountains, at an elevation of 9000 ft. in lat. 26° 45′ N., occurs *Rh. pilovittatum*, Balf. f. et W. W. Sm., an exceptionally tall relation often 10 ft. high. Then in Eastern Upper Burma, on the Nwai divide, at 12,000–13,000 ft., there is the dwarf-spreading *Rh. herpesticum*, Balf. f. et Ward. We have here a number of species which seem to constitute a natural group of Rhododendrons, and may expect that future exploration will add to the number.

At the same time we must not overlook many near relationships to other known species so close as to suggest that a correct

phylogeny will unite them all in one larger group. For another occasion must be reserved an account of the evidence for this, and of the delimitation of the larger group to which reference is made. Here may be put on record that merely slight differences mainly in the calyx and stamens, more conspicuous variations in indumentum, alone mark a number of allied species. We have already learned that in *Rh. haematodes*, a plant of the Tali Range at an elevation of 11,000–12,000 ft. in about lat. 25° 40′ N., an upper stratum of under-leaf indumentum forms a well-developed persistent woolly layer. We have the same in *Rh. farinosum*, Léveillé, a species from Eastern Yunnan at an elevation of about 10,000 ft., and doubtless these are representative of other species yet to be discovered. This upper indumentum layer becomes normally deciduous in *Rh. euchroum*, Balf. f. et Ward, a spreading procumbent shrub of the Nwai divide in E. Upper Burma at 10,000 ft. elevation; in the Eastern Szechwan species *Rh. detersile*, Franch.; and in the several plants from the Mekong-Salween divide in lat. 28° 12′ N. at 10,000–13,000 ft. elevation, from the Mekong-Yangtze divide in lat. 27° 36′ N. at 13,000 ft. elevation, and from the Chungtien plateau in lat. 27° 40′ N. at 13,000 ft. elevation, which in default of better knowledge are for the moment associated under the name *Rh. floccigerum*, Franch.

The small group to which reference is made on p. 123 as the Forrestii series has many characters in common with the plants of which I have been speaking, and possibly the best expression of affinity may be that which includes these Forrestii forms with the Sanguineums and the other species named in one group.

U7.05 **Rhododendron leptopeplum,*** Balf. f. et Forrest.†

Shrub 6–9 m. high with medium thick branches, the branches a year old densely glandular and shortly floccose the glands

* *λεπτός*, smooth; *πέπλος*, covering—in allusion to the smooth indumentum of leaf under surface.

† *Rhododendron leptopeplum*, Balf. f. et Forrest.—Frutex ad 9 m. altus ramis glandulosis et breviter floccosis. Folia ad 16.5 cm. longa; lamina chartacea oblanceolata circ. 14.5 cm. longa 4 cm. lata sursum attenuata subrostrata, margine cartilaginea subundulata haud asperata, deorsum attenuata basi obtusa; supra glabrescens pilorum glandularumque vestigiis notata; infra strato tenui demum plus minusve detersili indumenti e pilis copiose ramosis laxe intertextis constructi induta, costa media floccosa et glandulosa suberubescente prominula; petiolus ad 2 cm. longus glandulosus et floccosus. Flores in umbellam racemosam 12-floram dispositi; bracteae dense pubescentes; bracteolae lineares pedicellis breviores; pedicelli circ. 1.5 cm. longi glandulosi. Calyx membranaceus 5-lobus, glandulosus. Corolla campanulata flavido-alba roseo-suffusa kermesino-maculata et variculosa ad 4 cm. longa, extus intusque glabra, 5-loba; lobi ad 2.4 cm. lati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta puberula. Discus puberulus. Gynaeceum ad 3.8 cm. longum; ovarium circ. 4 mm. longum conoideo-truncatum dense glandulosum et puberulum, pilis simplicibus; stylus glaber.

nearly sessile. Foliage-buds unknown. Leaves petiolate about 16.5 cm. long; lamina chartaceous oblanceolate about 14.5 cm. long 4 cm. broad, at the apex somewhat beaked and ending in a red hydathodal tuberculate mucro, margin cartilaginous flat or slightly recurved inconspicuously undulate not roughened, tapered to the broadly obtuse base; upper surface slightly glossy bright green, midrib reddened grooved lined more or less with withered floccose hairs, primary veins about 15 on each side reddened slightly grooved, rest of surface slightly shagreened (when dry) glabrescent; under surface paler somewhat pale olive-green, midrib and primary veins raised, whole surface (venation included) clad with a thin sparse more or less detersile tomentum of whitish hairs with long stalks and many long more or less interlocking branches covering red or orange-coloured clavate glands particularly on veins and midrib; petiole as much as 2 cm. long grooved groove floccose, under surface copiously red-glandular and floccose. Inflorescence a racemose 12-flowered umbel, rhachis about 1 cm. long densely pubescent with intermixed glands; inner bracts oblong-spathulate obtuse about 2.5 cm. long 1.4 cm. broad at top, inside glabrous, at base outside silkily and densely hairy; bracteoles linear about 1 cm. long pilose throughout; pedicels about 1.5 cm. long glandular the glands red clavate. Calyx conspicuous about 4 mm. long cupular red; cup about 1 mm. long glandular 5-lobed; lobes membranous elliptic or ovate or rounded subequal glandular outside and fringed with stalked glands. Corolla creamy-white flushed rose with a dark crimson blotch posteriorly at the base and many crimson spots above, about 4 cm. long campanulate fleshy glabrous inside and outside, 5-lobed; lobes broad, posterior about 1.4 cm. long 2.4 cm. broad emarginate. Stamens 10 unequal shorter than corolla, longest about 3.4 cm. long with anther 3 mm. long, shortest about 1.4 cm. long with anther 2.5 mm. long; filaments slightly broadened downwards, from the base puberulous to above the ovary. Disk puberulous. Gynaeceum about 3.8 cm. long shorter than corolla longer than stamens; ovary conoid truncate about 4 mm. long grooved densely glandular the orange ovoid shortly stalked glands intermixed with some simple hairs; style glabrous thin slightly clavate below the lobulate discoid stigma.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° N. Alt. 13,000. Rhododendron forest. Shrub of 20–30 ft. Flowers fleshy creamy-white flushed rose. G. Forrest. No. 16,352. May 1918.

A distinct species of the Irroratum series. The species which it most resembles seems to be *Rh. araiophyllum*, Balf. f.

et W. W. Sm., and it has all the grace of that species and its delicacy of leaf-form and tint of colour. But *Rh. leptopeplum* is easily distinguished by the covering of indumentum on the leaf under-surface which is not at all glossy, the glandular pedicel, the relatively large glandular calyx, the glandular and puberulous ovary. By its persistent indumentum on the under-leaf surface it resembles most *Rh. agastum*, Balf. f. et W. W. Sm., which is a coarser species with broader and obtuse leaves, corolla puberulous inside and glandular style.

Rhododendron leptothrium,* Balf. f. et Forrest.†

Shrub 2–6 m. high with thin twigs and leaves, bearing lateral clustered flowers and a terminal foliage-bud. Branchlets a year old about 1 mm. in diameter grey puberulous the pubescence persistent on older twigs. Scale-leaves of the foliage-bud persistent for a time on elongating shoots. Leaves petiolate as much as 8 cm. long clustered at end of twigs persistent for several years; lamina thin papery lanceolate as much as 7 cm. long 2 cm. broad, attenuated to the emarginate blunt or somewhat truncate apex which has a prominent hydathodal apiculus about 1 mm. long arising in the sinus and falling off in older leaves, margin very thinly cartilaginous slightly roughened by traces of fallen setulose gland-cilia the cilia sometimes persistent near the base, base obtuse; surfaces opaque smooth, the upper dark green, lower slightly paler, midrib raised on both sides sometimes in a groove on the upper puberulous both above and below with short curved hook-hairs, primary veins about 10 on each side slightly raised, rest of the surfaces somewhat minutely papillate, upper surface obscurely punctulate by the

* *λεπτόθριος*, with thin fine leaves.

† *Rhododendron leptothrium*, Balf. f. et Forrest.—Frutex ad 6 m. altus. Rami tenues annotini circ. 1 mm. diam. puberuli, pube persistente. Folia petiolata ad 8 cm. longa plus minusve persistentia; lamina tenuis papyracea lanceolata ad 7 cm. longa 2 cm. lata sursum angustata apice truncata emarginata e sinu apiculata, apiculo nunc deciduo, margine glandularum setulosarum cicatricibus obscure aspera nunc glanduloso-ciliata, basi obtusa; supra opaca atroviridis laevis, subtus pallidior, utrinque costa media plus minusve elevata pilis hamatis brevibus puberula, caeteroquin minutissime papillata et setularum vestigiis obscuris sparsim notata; petiolus puberulus et glanduloso-setulosus. Flores solitarii axillares ad apicem ramulorum fasciculati; pedicelli puberuli et glanduloso-setulosi ad basim bracteis crustaceis convolutis sericeis cincti. Calyx subfoliaceus circ. 6 mm. longus 5-fissus; cupula extus glandulosa et puberula; lobi elliptici vel oblongi obtusi extus glabri piloso-ciliati. Corolla intense rosea maculata subrotata paullo obliqua circ. 2 cm. longa; tubus circ. 1 cm. longus intus pubescens; lobi subaequales emarginati. Stamina 5 corolla breviora; filamenta villosa, pilis saepe glandulosis. Discus glaber. Gynaeceum circ. 2.2 cm. longum corolla superans; ovarium parvum circ. 2 mm. longum petasiforme glandulis viscidum; stylus glaber. Capsula globosa vel globoso-ovoidea calyce inclusa ab apice valvis 5 ad medium dehiscens. Semina circ. 1 mm. longa subfusiformia exarillata.

bases of fallen setulose gland-hairs from the primary veins, the under surface showing depressions beneath the glands of the upper side and traces of a few glands also; petiole about 1–1.5 cm. long grooved above puberulous and gland-setulose. Flowers solitary axillary clustered at top of twigs each with its pedicel enclosed at base by the persistent bracts; flower-buds fusiform narrow-pointed about 6 mm. long and 2.5 mm. in diameter; bracts crustaceous outside, and inside grey with silky pubescence, ciliate and with a few sessile marginal glands, outer bracts small broadly ovate or rounded keeled and mucronate 2–3 cm. long, inner oblong oval acute convolute about 1 cm. long and 4 mm. broad; bracteoles unknown; pedicels about 1 cm. long pubescent with short curved hairs and glandular the glands oblong red with long setulose stalks. Calyx membranous about 6 mm. long cut to near the base into 5 lobes; cup glandular and pubescent outside like the pedicels; lobes elliptic or oblong about 3 mm. broad obtuse or rounded at apex glabrous outside finely hair-ciliate. Corolla deep-rose with crimson spots on the back subrotate slightly oblique about 2 cm. long; tube somewhat thick slightly expanding upwards densely puberulous inside about 1 cm. long glabrous outside; lobes 5 subequal (posterior a little larger) equalling in length or very slightly longer than tube, reflexing, posterior lobe about 1 cm. broad the others slightly narrower, emarginate slightly crenulate. Stamens 5 unequal shorter than corolla, 3 longer about 1.8 cm. long, 2 shorter about 1.4 cm., anther about 3 mm. long; filaments widened to base, from the base to middle and beyond densely villous with long vesicular-pointed hairs many of them glandular. Disk glabrous. Gynaeceum about 2.2 cm. long slightly longer than corolla; ovary very small barely 2 mm. long dome-shaped grooved densely clad with ascending long-stalked very viscid glands; style glabrous thin not swollen below the discoid broader lobulate lipped stigma. Capsule shortly globular ovate about 6 mm. in diameter completely enclosed by the slightly accrescent calyx dark brown or black sticky with remains of ovary glands, splitting by 5 lobes to about middle. Seeds small about 1 mm. long brown-yellow fusiform or narrowly pyriform or curved and with the chalazal end sharply bent, without wing or other aril, only slightly fringed at funicular end. Seedling with red stem glandular-setose over a pubescence of short hook-hairs; leaves not red on under surface, upper surface with pubescent midrib and scattered setulose glands over the surface each on a raised foot, under surface with depressions under the glands of upper surface, paler green with midrib similarly clothed and also a few setulose glands on midrib and primary veins.

N.W. Yunnan. On the Li-ti-ping. In open thickets. Alt. 11,000 ft. Lat. 27° 12′ N. Shrub of 6–10 ft. Flowers deep rose with crimson markings. G. Forrest. No. 13,881. June 1917.

N.W. Yunnan. Mekong-Yangtze divide. Lat. 27° 40′ N. Alt. 10,000–11,000 ft. In open thickets. Shrub of 10–20 ft. In fruit. G. Forrest. No. 12,845. July 1914.

Akin to *Rh. ovatum*, Planch., which as described seems to be an aggregate of more or less distinct forms, and requires analysis through an adequate number of specimens from different places in the wide area over which it is said to be spread—an area extending from Hong Kong on the south, Fukien, Kwangsi, and Chekiang on the south-east, to Western Hupeh on the west. Forrest has specimens of a plant from the Shweli-Salween divide (Nos. 9901, 11,850) and one from the western flank of the same divide (No. 9341), and also from mountains south of Tengyueh (No. 11,863), which are of the Ovatum series but are not *Rh. ovatum*, and which show differences from *Rh. leptothrium*. Their position has yet to be determined. *Rh. australe*, Balf. f. et Forrest,* a species from the neighbourhood of Tengyueh, is a near ally of *Rh. leptothrium*, but it has oblong or oblong-lanceolate tapered leaves not truncate or emarginate, of a pale grey-green colour on the lower surface, with a different reticulation of the venation, larger flowers, the calyx with broader lobes, gland-fringed not hair-ciliate, less fleshy corolla, stamens longer not glandular.

The hook-like simple hairs forming the puberulous covering of all the vegetative parts in *Rh. ovatum* and its allies seems to be an important diagnostic character of indumentum. With this is associated an upper stratum in most parts of setulose many-celled hairs ending in red ovoid glands which are no less characteristic.

4807 **Rhododendron leucopetalum,**† Balf. f. et Forrest.‡

Dwarf shrub as much as 1 m. high with thin straight short branches about 2 mm. in diameter when a year old and

* Description of this species will appear in a following number of these "Notes."

† λευκός, white—in allusion to the colour of the petals.

‡ *Rhododendron leucopetalum*, Balf. f. et Forrest. Frutex nanus ad 1 m. altus. Rami tenues stricti subvirgati glabrescentes folia 4–5 ad apicem rosulatim gerentes, perulis persistentibus haud vestiti, nodulosi. Folia ad 6.5 cm. longa; lamina coriacea obovata ad 5.5 cm. longa 3 cm. lata apice rotundata mucronulata, margine paullo recurvata, basi in petiolum alatum prolongata; supra olivacea obscure subrugulosa glabrescens costa media venisque primariis sulcatis; subtus costa media erubescente prominula, caeteroquin fulvo-grisea tomento compacto tenui persistente bistrato induta; petiolus ad 1 cm. longus glabrescens. Umbella terminalis 4–6-flora; pedicelli ad 2.5 cm. longi pilis

then glabrescent with traces of a juvenile indumentum of adpressed floccose hairs, at the top bearing a rosette of 4–5 leaves which persist in the rosette form for two or three years, annual growth short at most about 2 cm., marked throughout the branches by the nodulose summit, not clad at the base by persistent outer scale-leaves of the foliage-bud, older branches becoming more or less tawny before decorticating. Foliage-buds small narrow fusiform pointed; outer scale-leaves short crustaceous with a rounded or oblong base and an apiculus or tail, keeled and outside puberulous with white adpressed hairs more densely so around the base of the apiculus, margin flock-ciliate; inner scale-leaves membranous yellow ligulate-spathulate about 2 cm. long 8 mm. broad shortly apiculate and there pubescent, margin flock-ciliate; young leaves revolute sparsely caducously floccose. Leaves petiolate as much as 6.5 cm. long; lamina leathery obovate as much as 5.5 cm. long 3 cm. broad, apex obtuse or rounded tuberculate-mucronulate, margin cartilaginous slightly recurved, narrowed to base and prolonged into the petiole as a short wing; upper surface dark green mat slightly rugulose, midrib and primary veins (which are some 10 on each side) grooved glabrescent with traces of hairs in the midrib groove; under surface tawny grey becoming steel-grey, midrib raised tinted red and more or less floccose, primary veins also tinted red and raised ascending at an acute angle, rest of surface and also some of the primary veins covered with a thin compact persistent bistrate indumentum of an upper layer of shortly stoutly stalked hairs branching at end of stalk into many thin-walled spreading branches interweaving with those of adjacent hairs and forming a smooth scintillating slightly honeycombed surface, shorter stalked or sessile rosette-hairs occur below the longer ones, eglandular; petiole about 1 cm. long reddening glabrescent. Flowers in 4–6-flowered terminal umbels; bracts and bracteoles unknown; pedicels expanded below the flower as much as 2.5 cm. long often shorter white tomentose with fasciate floccose hairs, eglandular. Calyx with a short cup densely floccose outside about 1 mm. long 5-lobed; lobes unequal yellow membranous floccose outside flock-fringed at margin oblong or ovate unequal early deciduous. Corolla openly campanulate pure white about 3.7 cm. long; tube glabrous

fasciatis dense griseo-tomentosi, eglandulosi. Calycis cupula dense floccoso-tomentosa 5-loba; lobi membranacei flavidi extus et margine dense floccosi. Corolla alba aperte campanulata ad 3.7 cm. longa; tubus glaber intus basi septis incompletis divisus carneus 5-gibbosus; lobi lati rotundati. Stamina 10 inaequalia corolla multo breviora; filamenta glabra. Discus glaber. Gynaeceum corolla brevius staminibus longius; ovarium ad 6 mm. longum ovoideum truncatum pilis fasciatis dense tomentosum eglandulosum. Stylus glaber.

somewhat fleshy slightly 5-gibbous at base with imperfect interpetaline septa inside; lobes rounded about 1.4 cm. long 1.8 cm. broad. Stamens 10 unequal, longest about half the length of the corolla, shortest about 4 mm. shorter than long ones; filaments glabrous. Disk glabrous. Gynaeceum about 3 cm. long shorter than corolla; ovary ovoid truncate grooved about 6 mm. long densely tomentose with slightly pink-tinted fasciate floccose hairs, eglandular; style glabrous expanded at top below the broad-lipped lobulate stigma.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12,000–13,000 ft. Open rocky slopes and ledges of cliffs. Shrub of 2–3½ ft. Flowers pure white. G. Forrest. No. 14,270. July 1917.

One of the allies of *Rh. sanguineum*, Franch., distinguished by its pure white corolla. Perhaps its nearest relationship in the Sanguineum phylum is with *Rh. cloiophorum*, Balf. f. et Forrest, but that species has persistent scale-leaves over the stem, a thicker more developed tomentose upper stratum of the under-leaf indumentum, much larger calyx-lobes, which are glabrous outside, and the corolla is distinctly tubular-campanulate. See p. 80, where the relationships in the Sanguineum series are discussed.

Rhododendron levistratum,* Balf. f. et Forrest.†

Shrub as much as 3 m. high with stout branches. Branches of the year about 4 mm. in diameter completely clad in a cinnamon-coloured indumentum of floccose rosette-hairs with twisted branches often quite red persisting more or less for some years disappearing from the older grey branches. Foliage-buds oblong-ovoid pointed not sticky; outer scale-leaves more or less rounded apiculate caudate keeled rufous eglandular with a soft tomentum of floccose hairs outside, margin and summit

* *levis*, smooth—in allusion to the smooth leaf-indumentum.

† ***Rhododendron levistratum***, Balf. f. et Forrest.—Frutex ad 3 m. altus, ramis validis indumento floccoso plus minusve rufo indutis. Alabastra ovoidea acuta, perulis pilis floccosis molliter pubescentibus, intimis membranaceis spathulato-lanceolatis acuminatis. Folia ad 14.5 cm. longa; lamina ad 3.5 cm. lata coriacea lanceolata vel oblanceolata vel oblonga acuta nunc obtusa, margine paullo revoluta, basi obtusa; supra subnitida costa media sulcata in sulco floccosa caeteroquin glabrescens et pilorum juvenilium vestigiis notata; infra laevis primo pallide fulva diu cinnamomeo-rufa, superficie cum costa media prominula indumento persistente bistrato e pilis in strato supero stipitatis in strato infero rosulatis constructo praedita; petiolus ad 2 cm. longus dense rufo-tomentosus. Flores circ. 15 in umbellam racemosam terminalem dispositi; pedicelli 2 cm. longi floccosi. Calyx parvus lobis 5 obscuris. Corolla subcampanulata alba plus minusve roseo-suffusa maculata circ. 3.7 cm. longa lobis 5 latis. Stamina 10 inaequalia corolla dimidio subbreviora; filamenta puberula. Discus puberulus. Gynaeceum corolla brevius, staminibus longius; ovarium tenue circ. 4.5 mm. longum floccosum; stylus glaber.

as well as apiculus fringed with reddening besom-like or switch-hairs; inner scale-leaves spathulate from a narrow base in upper part lanceolate membranous acuminate clad like the outer ones, about 3 cm. long 6 mm. broad; young leaves in bud revolute densely clad on both surfaces by an indumentum of vesicular rosette-hairs. Leaves petiolate as much as 14.5 cm. long; lamina thickly leathery lanceolate oblanceolate or oblong as much as 12.5 cm. long and 3.5 cm. broad narrowed to an acute apex or sometimes obtuse with a conspicuous red-tipped hydathodal mucro, margin cartilaginous slightly revolute, base obtuse; upper surface slightly glossy shagreened (when dry) with a grooved midrib and inconspicuous primary veins about 12–14 on each side, whole surface glabrescent but clad with remains of juvenile floccose branched greasy reddish or brownish floccose hairs; under-surface mat never glossy, at first greenish buff- or ochre-coloured ultimately cinnamon-rufous and speckled or stippled with white, quite smooth, midrib raised, surface including midrib covered with a bistrate complete indumentum apparently never detersile, the upper stratum composed of shortly stalked hairs bearing several radiating horizontal vesicular unicellular branches of varying length tinted red or brown and overlapping to form a canopy beneath which lies the under stratum of rosette floccose nearly sessile hairs with short colourless branches—stages between the forms of hairs are found,—eglandular; petiole as much as 2 cm. long stout densely clad with persistent indumentum like that of the young stem. Flowers in a terminal racemose umbel about 15-flowered; bracts and bracteoles deciduous unknown; pedicels about 2 cm. long puberulous with simple and floccose hairs sometimes reddening eglandular. Calyx almost obsolete about 1 mm. long; saucer-shaped cup showing at the margin five obscure semi-lunate lobes or blunt teeth fleshy outside more or less puberulous hairs often brown. Corolla about 3.7 cm. long white flushed rose at margin and without a basal posterior blotch but with many crimson spots on posterior petal campanulate 5-gibbous at base, glabrous outside, puberulous inside; lobes 5 short and broad about 1.2 cm. long and 2 cm. broad crenulate. Stamens 10 unequal shorter than corolla and gynaeceum, somewhere about half the length of the corolla, longest about 2 cm. long with short rounded anther 1.75 mm. long, shortest about 1.3 cm. long with anther about 1.25 mm. long; filaments slightly widened downwards, from the base upwards to above the ovary finely puberulous. Disk puberulous. Gynaeceum about 2.5 cm. long shorter than corolla; ovary thin about 4.5 mm. long 2 mm. broad green cylindrico-conoid slightly grooved truncate more or less floccose; style glabrous

throughout slightly expanding into the lipped red lobulate medium-sized stigma.

W.N.-W.-Yunnan. Mountains north of Atuntzu. Lat. 28° 35′ N. Alt. 14,000 ft. In thickets. Shrub of 6–10 ft. Flowers white with crimson markings. G. Forrest. No. 14,026. June 1917.

W.N.-W.-Yunnan. Mountains north of Atuntzu. Lat. 28° 35′ N. Alt. 14,000 ft. Open situations amongst rocks. Shrub of 6–9 ft. Flowers white, faintly flushed rose on margins, with deep crimson markings. G. Forrest. No. 14,114. June 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 10′ N. Alt. 13,000 ft. In Rhododendron thickets. Shrub of 6–9 ft. Foliage only. G. Forrest. No. 13,364. Sept. 1917.

This is a distinct species—one of several plants showing an indumentum on the under-leaf surface approaching on the one hand the Lacteum series, and leading on the other hand to the Roxieanum series. In 1914 Mr. Forrest obtained it on the Mekong-Salween divide, but only in leaf, which in dried specimens was so striking that he took out with him in 1917 a specimen of the dried plant for comparison with plants on the spot in the hope of rediscovering it. In this he has been entirely successful. From north of Atuntzu we now have flowering specimens. The plant is easily recognised by its lanceolate leaves blunt at the base and with greenish or yellowish buff-coloured under side at first, changing to a cinnamon-rufous colour with age. Especially characteristic is the smooth not agglutinate indumentum, which has a speckled or stippled look. *Rh. levistratum* is an eglandular form, and I find no marks of stickiness anywhere.

4809 **Rhododendron lochmium,*** Balf. f.†

Tall bush with virgate branches bearing leaves along their whole length which are persistent for some three years. Year-

* *λόχμιος*, of a coppice—in allusion to habitat.

† *Rhododendron lochmium*, Balf. f. **Frutex altus virgatus, ramulis tenuibus puberulis et squamis peltatis parvulis noncontiguis asperatis. Folia petiolata ad 8.5 cm. longa deflexa ; lamina chartacea oblonga ad 7.5 cm. longa 2.5 cm. lata acuminata apice depressa, margine integra, basi obtusa ; supra atroviridis nitens convexa bullata costa media venisque primariis sulcatis, lepidota squamis brunneis minutis distantibus induta ; subtus pallide viridis costa media prominula flavido-albida punctulatim lepidota, caeteroquin squamis uniformibus rufis inter se distantibus intervallis quam squamae latioribus lepidota ; petiolus vix 1 cm. longus sulcatus sulco puberulo caeteroquin lepidotus. Flores in umbellas 2–3-floras laterales et terminales ad ramulorum apicem fasciculati ; bracteae sub anthesi persistentes ; bracteolae pedicellis multo longiores ; pedicelli circ. 1 cm. longi sub calyce haud expansi. Calyx cupularis circ. 2 mm. longus lobis sparsim ciliatis. Corolla circ. 2.5 cm. longa obliqua alba violaceo-suffusa maculata extus lepidota et puberula. Stamina 10 inaequalia corolla longiora ; filamenta villosa. Discus puberulus. Gynaeceum circ. 4 cm. longum corolla staminibusque longius ; ovarium conoideum truncatum circ. 3 mm. longum glauco-lepidotum ; stylus glaber.**

old twigs dark red glossy very finely puberulous and lepidote with small red shortly stalked uniform not contiguous persistent scales roughening the surface; older branches blackening and as they decorticate splitting to expose a green secondary cortex. Foliage-buds cylindric narrow about 2 mm. in diameter sharp-pointed with very few (3) outer brown elongated triangular sharp-pointed lepidote scale-leaves around broader green imbricate ovate or oblong-ovate or oblong scale-leaves slightly keeled and mucronate and green lepidote outside; young leaves conduplicate convolute. Leaves petiolate as much as 8.5 cm. long drooping; lamina chartaceous oblong as much as 8 cm. long 2.5 cm. broad remarkably convex above and concave below tapered to a long decurved apical point with a red tuberculate prominent mucro, margin finely cartilaginous sometimes red entire eciliate, base obtuse; upper surface dark-green glossy bullate, midrib sulcate finely puberulous, primary veins 10 to 12 on each side grooved, whole surface lepidote with small distant brown scales about 1 in a square mm.; under surface paler green with yellow whitish prominent midrib sparsely dotted with small brown peltate scales, the primary veins and ultimate reticulation showing clearly, the surface generally lepidote with red-brown small uniform peltate distant scales, the intervals usually wider than the diameter of the scales, about 8-10 in a square mm.; petiole under 1 cm. long green grooved above and there puberulous elsewhere finely lepidote. Flowers fugitive arranged in 2–3- (sometimes 1-) flowered terminal and axillary umbels three to four umbels usually fascicled at the end of the branches, one of them terminal, often without the terminal one which is replaced by vegetative bud; flower-bud ovoid pointed green; bracts persistent during flowering ensheathing the pedicels all brown chartaceous lepidote and puberulous outside, inside glabrous, ciliate, outermost small rounded thicker keeled mucronate, innermost more membranous oblong-spathulate or obovate truncate retuse or emarginate with a short apiculus, longer than the pedicel about 1.7 cm. long 1 cm. broad; bracteoles persistent after flowering linear expanded into a spathulate top about 1 mm. broad brown pilose and lepidote outside hair-crested longer than pedicel about equalling innermost bracts; pedicels 1 cm. or less long green or tinted red on upper side, lepidote with discontiguous scales, inserted abruptly into centre of calyx, slightly deflexed. Calyx small cupular fleshy about 2 mm. long or less green or pink-tinted; limb often obsolete or as small short teeth or as rounded or pointed lobes sometimes unequal (the postero-lateral larger) .5 mm. long membranous tinted pink and with a few cilia. Corolla about 2.5 cm. long oblique

butterfly-shape white flushed violet with a faint yellow tinge on posterior side of limb and there spotted with pale ochre-brown spots sparsely lepidote and puberulous outside posteriorly ; tube funnel-shaped concave in front and there 4 mm. long, convex on back grooved and longer, expanding into a concave patent limb, puberulous inside at base, 5-lobed two-lipped upper lip three-lobed ; lobes rounded or elliptic or oblong undulate sub-erect, posterior smallest about 1.5 cm. long 1.3 broad, antero-lateral divergent slightly larger and narrower 1.7 cm. long 8 mm. broad. Stamens 10 unequal longer than corolla, longest about 3.7 cm. long with oblong anther 2 mm. long, shortest about 1.5 cm. long with nearly globose anther 1 mm. long ; filaments slender white or tinged violet wider to base, base glabrous over 3–4 mm. to above ovary, then filaments on posterior side villous to mouth of corolla-tube, on anterior side puberulous only ; anthers pink. Disk puberulous. Gynaeceum about 4 cm. long or more exceeding the stamens and corolla ; ovary conoid truncate about 3 mm. long 2 mm. in diameter green but glaucous, lepidote with nearly contiguous whitish peltate scales, a few hairs at summit ; style glabrous long thin white not swollen below the small green lobulate narrow lipped stigma.

Szechwan. Wilson. No. 1220 in part.

One of the several species which have appeared in cultivation under numbers of Wilson's collections assigned to *Rh. Davidsonianum*, Rehd. et Wils. and other members of the Triflorum series. *Rh. lochmium* came under No. 1220. That number ought to be *Rh. villosum*, Rehd. et Wils. a very different plant. Its nearest relations in the Triflorum series are *Rh. polylepis*, Franch. and *Rh. Searsiae*, Rehd. et Wils., and with these it forms a distinct group easily distinguishable from all other species in the series by foliage-characters :—Oblong chartaceous sharp-pointed leaves with very convex and bullate dark-coloured lepidote upper surface and densely lepidote under surface, the tip always depressed and the whole leaf more or less deflexed. The young leaves convolute in bud become revolute as they expand. The convexity of the upper surface is brought about by the sides of the lamina on each side of the midrib curving upwards abruptly from it leaving it in a groove and then curving downwards towards the margin. Large though the Triflorum series now is—including some 30 or more species,—no one of the other members can be confused with the three species forming this little Polylepis set within the series. The species are easily distinguished from one another both by vegetative and flower-characters, thus :—

*Rh. polylepis.**	*Rh. Searsiae.*	*Rh. lochmium.*
Young twigs reddening not glossy, lepidote with scurfy brown scales on long stalks, yellow on short. Epilose.	Young twigs not reddening somewhat glossy, prominently warted with brown and yellowish scales like small mushrooms. Epilose.	Young twigs dark red glossy, lepidote with small red shortly stalked discontiguous uniform scales roughening the surface. Finely puberulous.
Leaf-margin notched. Leaf-base obtuse. Under surface tawny green densely lepidote with partly contiguous scurfy scales and punctulate with some large projecting brown ones.	Leaf-margin notched. Leaf-base cuneate. Under surface white-grey lepidote with many small yellowish discontiguous scales and punctulate with a few large brown ones.	Leaf-margin entire. Leaf-base obtuse or rounded. Under surface pale green lepidote with small uniform discontiguous scales.
Flowers in 5-7-flowered terminal umbels. Scale-leaves of bud yellow-green.	Flowers in 8-10-flowered terminal umbels rarely additional lateral ones. Scales-leaves of bud with red margin and keel.	Flowers in 2–3-flowered terminal and axillary umbels fasciculate at end of twigs. Scale-leaves of bud yellow-green.
Corolla-tube red, limb purple, brown-spotted, outside densely lepidote and epilose.	Corolla pale lavender becoming white in throat, green spotted, lepidote outside and epilose.	Corolla white flushed violet faintly yellow posteriorly, sparsely brown-spotted, sparingly lepidote outside and puberulous.
Stamens longer than corolla.	Stamens shorter than or equal to corolla.	Stamens longer than corolla.
Style longer than corolla, slightly hairy at base.	Style longer than corolla, slightly hairy at base.	Style much longer than corolla, glabrous.

* *Rh. Harrovianum*, Hemsl., must be included in *Rh. polylepis*, as Rehder and Wilson state.

The new species *Rh. lochmium* has appeared in several gardens, commonly under the designation *Rh. Davidsonianum*, and if one may judge from the specimens sent by correspondents to Kew for naming—specimens which are preserved in the Kew Herbarium and which the Director of Kew has been so good as to lend to me for examination,—the plant has been a puzzle to growers who seem to have recognised that it was not *Rh. Davidsonianum*. True, *Rh. Davidsonianum* I take to be Wilson's "No. 1275 type" of Plantae Wilsonianae. Of it we have dried specimens. It is an easily recognised plant, and it may be helpful if I give here some of its distinctive characters for separation from *Rh. lochmium* and other forms that have been confused with it:—Young twigs dark purple-red—but often green—hardly glossy finely puberulous lepidote with many small discontiguous red or yellow scales some large

some small. Leaves thick and leathery lanceolate or oblong commonly about 5 cm. long 1 cm. broad narrowed to an acute point, margin scale-notched, base cuneate or obtuse; upper surface concave the sides of the lamina bent upwards from the puberulous midrib, dark green glossy sprinkled with reddish distant scales, intervals between the scales much wider than the scales; under surface tawny green or even brown lepidote, with many scales partly contiguous partly discontiguous the intervals never so wide as the scales. Flowers in a terminal 3–4-flowered umbel. Corolla rose-lavender red spotted, lepidote and epilose outside. Stamens and style longer than corolla. Style finely puberulous at base.

As in all the Rhododendrons of the Triflorum series, the foliage varies according to situation of the plant. Grown in a greenhouse instead of outside, *Rh. Davidsonianum* is a different-looking plant.

Rh. lochmium is most floriferous, and flowers early in spring. The corollas of the past flowers hang long upon the inflorescence, and, associated with the long persistent thread-like styles, give a ragged look to the plant after the first flush of flower. A noteworthy feature of the inflorescence is the length of the bracteoles. They are much longer than the pedicels and as long as the inner bracts, and when expansion of the inflorescence bud begins they push out between the bracts, apparently acting as wedges for separating the bracts and thus facilitating the opening of the flower-bud. These bracteoles (prophylla) of the flower-axis are more or less developed in Rhododendron, differing in form and size in the several species, and here as in other genera where they are found the question of their use has doubtless occurred to many observers. It is a matter to which little attention has been given by botanists. Their name prophyll is reminiscent of archetypal hypothesis of their existence as the equivalents at the base of each phyton composing the plant of the cotyledons appearing on the embryo, which cotyledons must therefore be assumed to be foliar, and this is open to dispute. Beyond the valid statement that in vegetative parts prophylls may be protective—filling up the gaps at the side of the leaf-axils,—and sporadic references to specific transformations of them,—for instance into tendrils in Cucurbitaceae, into wing-parachutes in the lime-tree,—and so forth, their part in the life-work of plants has been ignored. Their wedge-function in relation to flower-expansion, which is so evident in *Rh. lochmium*, will perhaps be found to be one of wide occurrence, it is so in the genus Rhododendron, and deserves to be investigated in other plants.

Rhododendron lophophorum,* Balf. f. et Forrest.†

Sticky shrub as much as 2 m. high with faintly red branches about 3.5 mm. in diameter when a year old, densely glandular with stalked red ovoid glands having some interspersed floccose hairs; older branches glabrescent. Foliage-leaf buds unknown. Leaves petiolate, as much as 11.5 cm. long; lamina thinly leathery oblong or oval-oblong or oboval-oblong about 10.5 cm. long 3.5 cm. broad slightly tapered at apex into an apiculate tip with a tuberculate mucro, margin slightly cartilaginous plane not recurved, base obtuse narrowly or broadly; upper surface dark green somewhat varnished, the midrib grooved, primary veins about 16 on each side slightly prominent (when dry), groove of the midrib and whole surface marked by blackening vestiges of glands and floccose hairs (in the young leaf the surface is more or less densely clad with many glands and loose elongated branched hairs with thin walls); under surface dull dirty buff-coloured with prominent red-tinted glandular midrib, the primary veins hardly showing beneath the smooth minutely punctulate parchment-like persistent indumentum, the punctulations are red glands which often blacken and they are embedded in the agglutinated thin-walled broad long branches of floccose more or less rosette-like hairs; petiole about 1 cm. long thick wrinkled grooved above densely glandular red at first becoming black through the drying up of the glands. Inflorescence a small racemose-umbel of some 8 flowers, rhachis about 5 mm. long sparingly floccose; bracts unknown; bracteoles short filiform about 3 mm. long pilose from base and hair-crested; pedicels about 1.5 cm. long more or less, somewhat unequal pale green and sparingly floccose eglandular. Calyx small about 1 mm. long fleshy with 5 very small rounded or tooth-like marginal projections, altogether glabrous. Corolla narrowly campanulate white flushed rose sparingly spotted posteriorly about 3.2 cm.

* λόφος, crest—in allusion to the hair-crest of the ovary.

† *Rhododendron lophophorum*, Balf. f. et Forrest.—Frutex glutinosus ad 2 m. altus ramis juvenilibus dense rubro-glandulosis et floccosis demum glabrescentibus. Folia ad 11.5 cm. longa; lamina tenuiter coriacea oblonga vel ovali-oblonga vel obovali-oblonga ad 3.5 cm. lata apiculata, margine plana, basi obtusa; supra atro-viridis subvernicosa vestigiis glandularum floccorumque notata; infra laevis sordide fulva pilis agglutinatis induta et minute glanduloso-punctulata; petiolus circ. 1 cm. longus glandulosus nigricans. Flores in racemoso-umbellam 8-floram dispositi; bracteolae breves ad 3 mm. longae; pedicelli subinaequales circ. 1.5 cm. longi floccosi eglandulosi. Calyx parvus glaber. Corolla anguste campanulata alba roseo-suffusa sparsim maculata circ. 3.2 cm. longa intus obscure puberula 5-loba; lobi rotundati 1.2 cm. longi et lati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta puberula. Discus puberulus. Gynaeceum corolla brevius; ovarium petasiforme glaberrimum sed apice piloso-cristatum; stylus glaber.

long, thin glabrous outside obscurely puberulous at base inside on the posterior surface, expanding into a 5-lobed open limb; lobes rounded emarginate about 1.2 cm. long 1.2 cm. broad. Stamens 10 unequal shorter than corolla and gynaeceum, longest about 2.4 cm. long with anther 2.5 mm. long, shortest about 1.7 cm. long with anther 2 mm. long; filaments widened and flattened downwards, from the base puberulous upwards in the shortest stamens through half the length, in the longer over less distance. Disk puberulous. Gynaeceum about 2.8 cm. long, shorter than corolla longer than stamens; ovary about 3.5 mm. long dome-shaped truncate slightly grooved glabrous but with hair-crest of simple hairs at the summit around the style; style glabrous stout somewhat clavate at top below the discoid lobulate stigma.

W.N.-W.-Yunnan. Mountains north of Atuntzu. Lat. 28° 35′ N. Alt. 13,000 ft. In open pine forest. Shrub of 6–8 ft. Flowers white flushed rose with few markings. G. Forrest. No. 13,971. June 1917.

A species characterised by its sticky leaves. In the older leaves the indumentum disappears from the upper surface, but the glands leave a varnished surface. The under-leaf indumentum is distinguished by the great development of glands, which often blacken with age and give the whole surface a punctulate look. The glands are immersed in what appear to be rosette hairs with many stout thin-walled branches, and these lying over one another become agglutinated and make a continuous smooth surface. But the indumentum is not crustaceous. No foliage-buds nor young leaves are on the specimens and I cannot therefore determine with certainty the form of the hairs of the under-leaf indumentum. Other diagnostic marks are:—the slightly floccose pedicels, glabrous calyx and corolla, glabrous ovary save for a crest of many white simple hairs at its top.

The position of the species appears to be amongst the many species which Forrest has been gathering that show an indumentum not so simple as that of the Lacteum series and not so complex as that of the Roxieanum series.

4811 **Rhododendron Martinianum,*** Balf. f. et Forrest.†

Shrub 1–2 m. high with stiff branchlets bearing in distant false whorls the leaves of three years. Stems swollen at

* Named in compliment to John Martin, gardener at Caerhays Castle, with charge of the Rhododendrons grown there for Mr. J. C. Williams, which with those grown at Werrington Park form the most complete collection ever brought together.

† *Rhododendron Martinianum*, Balf. f. et. Forrest.—Frutex ad 2 m. altus ramis strictis erectis folia pseudo-verticillata per annos tres persistentia gerentibus nodulatis. Ramuli hornotini erubescentes ceriferi circ. 1.5 mm. lati glandu-

the position of the whorls and when the leaves fall giving a nodulose character to the branches. Branchlets of the year reddened wax-glaucous about 1.5 mm. in diameter densely glandular, glands red ovoid on long setiform red greasy stalks or globular on short stalks; older branches soon becoming grey-white and red-punctulate with bases of fallen glands ultimately dark grey before decorticating. Foliage-buds small acute purple with wax-bloom; outer scale-leaves keeled tailed from a rounded base glabrous; innermost scale-leaves ligulate-spathulate membranous; young leaves revolute (?), upper surface and margin glandular, glands with long stalks, the former also puberulous, under surface sprinkled with white capitate glands on short red stalks; petiole glandular like upper surface. Leaves petiolate, as much as 5 cm. long; lamina rigid thickly leathery elliptic or elliptic-oblong as much as 4.3 cm. long and 2.5 cm. broad rounded at apex and apiculate, apiculus often 1.5 mm. long ending in a red tubercle-like hydathode, margin thickly cartilaginous recurved somewhat undulate and obscurely roughened with feet of fallen glands, base broadly obtuse or truncate or rounded and slightly cordulate; upper surface opaque smooth sprinkled with a few glands and flocks and spotted with bases of fallen similar glands and flocks, midrib grooved reddened and at the base lined by glands, primary veins concealed; under surface paler glaucous often pinkish punctulate all over with glands, midrib elevated, primary veins pink and with ultimate venation slightly raised; petiole grooved as much as 7 mm. long red more or less glandular with setiform and other glands. Flowers in pairs (occasionally 3 or 1) each pair forming a 2-flowered terminal umbel; bracts and bracteoles unknown; pedicels long slender 3 cm. or more long stiff erect glaucous and reddened more or less coated with setiform glands and shorter glands and with an occasional floccose hair. Calyx small about 2.5 mm. long; cup fleshy pulvinately swollen at base glabrous outside glaucous erubescent; lobes equalling cup broadly triangular or semi-lunate or rounded glabrous on

losi (glandulis stipitatis brevibus et setiformibus) mox glabrescentes. Alabastra cerifera. Folia ad 5 cm. longa; lamina rigide coriacea elliptica vel elliptico-oblonga ad 4.3 cm. longa 2.5 cm. lata longe apiculata basi late obtusa vel rotundata vel subcordulata; supra opaca glandulis floccisque plus minusve conspersa; subtus glauca venis prominulis erubescentibus glanduloso-punctulata; petiolus sulcatus ad 7 mm. longus ruber plus minusve glandulosus. Flores in umbellas terminales 2–3-floras dispositi; pedicelli longi circ. 3 cm. longi glandulosi. Calyx parvus 5-lobus; lobi dorso glabri glanduloso-ciliati. Corolla aperte campanulata pallide rosea 3.5 cm. longa ubique glabra 5-loba; lobi rotundati. Stamina 10 inaequalia corolla paullo breviora; filamenta puberula. Discus puberulus. Gynaeceum circ. 3.4 cm. longum corolla paullo brevius, staminibus longius; ovarium conoideum sursum in stylum angustatum dense glandulosum; stylus basi glandulosus.

back gland-fringed, glands stalked. Corolla pale rose openly campanulate 3.5 cm. long glabrous out and in 5-lobed; lobes about 1.5 cm. long and 2 cm. broad rounded imbricate emarginate. Stamens 10 unequal, longest about 3.2 cm. long a little shorter than corolla with anthers oblong about 3 mm. long, shortest about 1.7 cm. with anthers about 2 mm. long nearly globose; filaments widened below, from the base upwards to above ovary puberulous. Disk minutely puberulous below ovary. Gynaeceum about 3.4 cm. long, slightly shorter than corolla exceeding stamens; ovary 2.5 mm. long conoid narrowed into base of style grooved densely glandular, glands clavate orange-coloured and stalked; style glandular at very base with shortly stalked glands hardly expanding into lobulate lipped stigma. Capsule somewhat sickle-shaped about 2.5 cm. long and 6 mm. in diameter pale brown or tinted glaucous pink slightly warted dehiscing from apex by 5 valves. Seeds very pale straw-coloured flattened oblong about 3 mm. long and 0.5–1 mm. broad; body of seed striate about 1.5 mm. long with arillar wing of nearly equal width all round and a chalazal crest and funicular broad extension.

W.N.-W.-Yunnan. Mekong-Salween divide. Alt. 11,000 ft. Lat. 28° 10′ N. Open rocky pasture and on the margins of thickets. Shrub of 3–6 ft. G. Forrest. No. 13,301. Sept. 1914; in full fruit. No. 13,439. Oct. 1914.

W.N.-W.-Yunnan. Mekong-Salween divide. Alt. 12,000 ft. Lat. 28° 12′ N. Open thickets and scrub. Shrub of 4–6 ft. Flowers pale rose. G. Forrest. No. 13,949. June 1917.

A most distinct and beautiful species first found by Forrest during his exploration of Yunnan in 1914, in fruit, and with a single withered flower on a ripening capsule. He has obtained specimens in flower in course of the exploration in which he is now engaged, and these enable me to complete the description of the species. From seeds collected in 1914 Mr. J. C. Williams of Caerhays Castle has raised seedling plants.

The species belongs perhaps to the Souliei series or should be placed between the Souliei and Selense with some other species with partially glandular style, and is readily distinguished by its habit and the nodulose swellings of the branches at the end of each year's growth, by the very thick rigid small leaves disposed in false whorls which persist for three years, markedly punctulate with persistent glands on the underside, and by the 2–3-flowered umbels of long-stalked flowers. The nodulose swellings on the stem are of the same character as those which are found on *Rh. temenium*, Balf. f. et Forrest, a beautiful species from the Tsarong, and in plants of the Sanguineum series—all showing the same habit of leaves in pseudo-whorls. The

nodules appear like beads on a rosary chain, separated by cylindric portions of the stem on which are visible the scars of the fallen innermost scale-leaves. The nodule itself is formed by the clustering of the leaves and the suppression of elongated internodes at the end of each year's growth.

48?2

Rhododendron microgynum,* Balf. f. et Forrest.

Shrub about 1 m. high with short annual growths and rigid straight erect young branches, those a year old about 3 mm. in diameter completely clothed by a tawny indumentum (later often whitening when withered) of much-branched long imbricate floccose hairs mixed with ovoid red-stalked glands; older branches more or less glabrescent grey blackening, not nodulose. Foliage-bud narrow oblong fusiform, exposed scale-leaves brown crustaceous rounded below keeled long apiculate or cuspidate with a thin brown or whitish indumentum outside, ciliate, all deciduous. Leaves petiolate, as much as 9 cm. long not closely rosulate at end of year's growth; lamina thickly leathery lanceolate or oblanceolate as much as 8 cm. long 2 cm. broad narrowed towards the apex where is a tuberculate conspicuous mucro, margin cartilaginous revolute, narrowed to the obtuse or somewhat cuneate base; upper surface opaque shagreened (when dry) everywhere sprinkled with withered vestiges of juvenile floccose hairs particularly in the groove of the midrib primary veins about 12 on each side hardly visible; under surface buff-coloured or dark fawn-coloured covered uniformly everywhere with a dense (midrib sparingly) bistrate indumentum, its upper layer of long much-branched hairs not dendriform more or less brown-coloured with wide cells

* *Rhododendron microgynum*, Balf. f. et Forrest.—Frutex nanus ad 1 m. altus. Rami rigidi primum indumento fulvo albescente pilorum floccosorum et glandularum rubrarum vestiti, glabrescentes. Alabastra elongata subfusiformia perulis exterioribus rotundatis apiculatis vel cuspidatis mox deciduis. Folia petiolata ad 9 cm. longa; lamina coriacea lanceolata vel oblanceolata circ. 8 cm. longa 2 cm. lata sursum attenuata mucrone prominulo, margine revoluta, deorsum angustata basi obtusa vel cuneata; supra atroviridis opaca glabrescens sed pilorum vestigiis notata, costa media sulcata, venis primariis vix conspicuis; subtus plus minusve fulva costa media elevata, ubique indumento bistrato scintillante vestita, strati inferi pilis multi-ramosis ramis longis vesiculosis intertextis, strati inferi pilis rosulatis ramis latis brevibus vesiculosis; petiolus circ. 1 cm. longus crassus tomentosus et glandulosus. Umbella 5–6-flora terminalis; bracteolae circ. 9 mm. longae pedicellis paullo breviores; pedicelli circ. 1.2 cm. longi glandulosi floccosi. Calyx parvus circ. 2 mm. longus 5-lobus glandulosus et floccosus; lobi oblongi vel rotundati ciliati. Corolla obliqua rosea sparsim maculata circ. 3 cm. longa aperte campanulata intus puberula; lobi 5 rotundati emarginati. Stamina 10 inaequalia parva, corolla multo breviora; filamenta lata puberula et glandulosa. Discus puberulus. Gynaeceum breve circ. 7 mm. longum staminibus brevius; ovarium ovoideum truncatum circ. 2.5 cm. longum glandulosum et floccosum; stylus ovario vix duplo-longior decurvus glaber.

interlocking and becoming matted as a compact smooth slightly scintillating surface, its under layer of rosette-hairs with short spreading vesicular unicellular branches (intermediate hair-forms also occur), midrib elevated, rest of venation hidden; petiole about 1 cm. long stout grooved above coated with an indumentum like that of young stem, more or less glabrescent. Flowers in terminal few-flowered (5–6) umbels; bracts unknown; bracteoles about 9 mm. long slightly shorter than pedicels linear-clavate brown membranous pilose with white hairs throughout on the back; pedicels about 1.2 cm. long clad with stalked ovoid red glands and floccose greasy often red or brown branched hairs. Calyx small about 2 mm. long cut to the base into 5 lobes cup outside glandular and hair-coated like the pedicels; lobes oblong or rounded or semi-lunate about 1.5 mm. long sparingly glandular and floccose on back, margin ciliate and glandular, the glands red-stalked. Corolla dull soft rose without blotch but with faint crimson spots fleshy about 3 cm. long openly campanulate from base, slightly oblique 5-gibbous, puberulous inside, glabrous outside, 5-lobed, posterior lobe the largest semi-lunate about 1.3 cm. long 2 cm. broad emarginate crenulate. Stamens 10 unequal very short, longest about 1.7 cm., shortest about 1 cm. long, the anthers grouped in the centre of the flower over the style; filaments yellow stout broadly widened downwards, from base upwards through one-third to three-fourths of length puberulous with many short stout pointed hairs and glandular with short-stalked ovoid uncoloured glands; anthers oblong ovoid about 3 mm. long in long stamens, 2 mm. in short. Disk slightly puberulous below ridges of ovary. Gynaeceum very short about 7 mm. long shorter than shortest stamens; ovary ovoid with truncate top about 2.5 mm. long slightly grooved glandular with long-stalked ovoid ascending glands, also coated with floccose branched greasy hairs often brown or red; style very short not twice length of ovary slightly decurved glabrous hardly expanding under the small-lobed and lipped stigma.

S.E. Tibet. Tsarong. Open situations on rocky slopes of Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 12,000 ft. Shrub of 4 ft. Flowers dull soft rose with faint crimson markings. G. Forrest. No. 14,242. July 1917.

A species recalling by its habit members of the Sanguineum series, and also plants like *Rh. perulatum*, Balf. f. et Forrest. Its leaves, while of the general form found in the cycles of affinity named, are not so aggregated at the ends of the annual growths, and in consequence the branches do not show the nodular swellings which such leaf-disposition commonly brings about. The scale-leaves of the foliage-bud do not persist

as a covering to the stems, and this separates *Rh. microgynum* at once from *Rh. perulatum* as well as from some of the Sanguineum series. The flower-characters are on the whole against very close affinity with the Sanguineum series. The pedicels, grouped stamens, glandular ovary are all Sanguineum features, but the small calyx, the oblique corolla openly campanulate from the base, the glandular filaments, are not typical of the Sanguineum series, and then there is the remarkable very short differentiating style. The foliage and its indumentum, the smaller calyx and oblique campanulate corolla, might suggest the Taliense series, but the glandular stems, petioles, pedicels, filaments and ovaries, as well as the very short style, are very different from what is typical of that series.

The length and form of style is unique amongst Rhododendrons which the species resembles. At first glance one suspects abnormality. But the character is found in all the flowers, and on the end of this style, not twice the length of the ovary, a well-developed lobulate stigma appears. I cannot be certain from my material whether the style is always decurved or not. It is conspicuously so in some flowers. The typical Rhododendrons with decurved style are those of the Boothii series and of the Lepidotum series, but to none of them is *Rh. microgynum* allied. For the moment one must regard it as a form on the fringe of the Taliense, Roxieanum, and Sanguineum series.

4678 **Rhododendron muliense**,* Balf. f. et Forrest.†

Dwarf shrub small-leaved under 1 m. high, with short thin

* **Mu-li—the region whence the plant comes.**

† *Rhododendron muliense*, Balf. f. et Forrest.—Frutex parvifolius nanus vix 1 m. altus ramis tenuibus brevibus. Rami annotini circ. 0.75 mm. diam. puberuli et squarrosim lepidoti. Alabastra ovoidea obtusa; perulae paucae, extimae crustaceae lepidotae et puberulae, intimae membranaceae. Folia petiolata ad 1.5 cm. longa; lamina crasse coriacea oblongo-ovalis circ. 1.3 cm. longa 6 mm. lata apice rotundata brevissime mucronulata, margine paullo undulato-crenulata recurva, basi obtusa vel late cuneata; supra atro-viridis et squamis griseis contiguis siccis adpressis haud scintillantibus lepidota, costa media angusta; subtus pallide fulva squamis bicoloribus rufis et viridibus intermixtis vestita (intervallis glaucis quam squamae angustioribus), costa media prominula; petiolus circ. 2 mm. longus squarrosus. Flores in umbellam compactam terminalem 5–6-floram aggregati; bracteae dense lepidotae et puberulae ciliatae; bracteolae claviformes calycem subaequantes; pedicelli circ. 2 mm. longi albido-porriginosi. Calyx viridis cupularis ad 7 mm. longus 5-partitus; cupula extus lepidota circ. 1 mm. longa; lobi membranacei oblongi vel ovati obtusi vel acuti vel erosi extus lepidoti intus laxe pilosi ciliati. Corolla laete flava circ. 1.7 cm. longa subrotata; tubus campanulatus intus pubescens circ. 4 mm. longus; lobi 5 ovales apice rotundati profunde crenulati circ. 8 mm. longi 6 mm. lati. Stamina 10 alternatim longiora et breviora corolla breviora; filamenta supra basim villosa. Discus dense puberulus. Gynaeceum corollam subaequans staminibus longius; ovarium circ. 2 mm. longum cylindricum truncatum dense lepidotum et puberulum superne pilis cristatum; stylus basi puberulus.

curved branches. Branches a year old about 0.75 mm. in diameter puberulous and densely squarrosely lepidote, some scales short-stalked adpressed to stem, others long-stalked with cup-shaped disk the fringe upturned, disk often falling from the setulose-like white stalk; older branches blackening and more or less warted by the scales. Foliage-buds ovoid blunt scale-leaves few (about seven); outer ones pale brown somewhat crustaceous rounded to oval or ovate-oblong hardly keeled obscurely mucronulate inside at top silky, outside puberulous and spongily lepidote, more or less ciliate; innermost scales yellow more or less membranous scaphoid oblong-obovate about 7 mm. long 5 mm. broad rounded at top hardly mucronulate inside silky at top, outside puberulous and lepidote, floccosely fringed particularly at top; young leaves convolute densely lepidote on both surfaces within the bud, showing a few hairs at the top otherwise epilose, petiole puberulous above with short simple hairs. Leaves petiolate about 1.5 cm. long; lamina thick leathery oblong-oval about 1.3 cm. long 6 mm. broad rounded at the apex minutely mucronulate, margin slightly undulate-crenulate and recurved, base obtuse or broadly cuneate; upper surface dark green mat grizzly with dried almost contiguous not scintillating uniform peltate scales, the scales with broad umbo sometimes citron-coloured the equally broad fringe colourless and spread flat, groove of the midrib hardly visible; under surface pale buff-coloured with a prominent midrib, lepidote with bicoloured discontiguous uniform scales some rufous some greenish equally mixed, the rufous scales with broad convex umbo infiltrated with red secretion, the greenish ones often with a yellow-tinted annulus, interval between the scales less than the diameter of the scales glaucous covered by close-set epidermal wax-bearing papillae; petiole about 2 mm. long grooved above puberulous and lepidote like the young stem. Flowers in a compact 5–6-flowered terminal umbel; bracts falling early, inner ones oblong-oval with rounded or flattened shortly mucronulate tip densely lepidote and puberulous outside, ciliate; bracteoles clavately filiform about 8 mm. long exceeding the pedicels about equalling the calyx thinly pilose at the top ending in long bristle hairs; pedicels short about 2 mm. long scurfily whitely lepidote. Calyx green cupular about 7 mm. long cut to near base into 5 lobes; cup flattened lepidote outside about 1 mm. long; lobes membranous oblong or ovate obtuse or rounded or erose or acute, densely lepidote outside loosely pilose inside, margin ciliate with long hairs. Corolla bright yellow about 1.7 cm. long somewhat rotate; tube broadly campanulate darker yellow about 4 mm. long glabrous outside,

inside densely puberulous, expanding into a slightly concave 5-lobed disk; lobes oval or elliptic rounded at top about 8 mm. long 6 mm. broad beautifully crenulately fringed. Stamens 10 alternately long and short shorter than corolla, longest about 1.2 cm. long, shortest about 1 cm. long; filaments orange-coloured slightly widened downwards naked at base over 1–2 mm. then villous to a little above mouth of corolla-tube. Disk densely puberulous. Gynaeceum about 1.5 cm. long not quite as long as the corolla longer than stamens; ovary about 2 mm. long cylindric truncate grooved lepidote with white imbricate scales mixed with some hairs which are more numerous at top and there form a crest; style red puberulous at base expanded at top under the lobulate stigma.

S.W. Szechwan. Mu-li mountains, valley of the Li-tang river. Lat. 28° 12′ N. Alt. 12,000–13,000 ft. In pine forests and on open rocky pasture. Shrub of 1½–2½ ft. Flowers bright yellow. G. Forrest. No. 16,252. June 1918.

Rh. muliense is the last comer of the small number of yellow-flowered members of the Lapponicum series.

Forrest has given special attention to these forms during the past two years and has sent home some splendid material of *Rh. chryseum* which is evidently the Yunnan type of the series. Now that he has broken into W. Szechwan one of the first-fruits is this new species which has come in a postal packet to Mr. J. C. Williams of Caerhays Castle. A glance at the specimen suffices to tell that this plant is different from all others known, and in a few words the diagnostic marks can be stated.

Its indumentum with bicolorous scales dark and light equally intermixed and separated by less than the diameter of the scale distinguishes it from *Rh. flavidum*, Franch. and *Rh. primulinum*, Hemsl., which have concolorous dark scales separated by more than the diameter of the scales.

This indumentum character it shares with *Rh. chryseum*, Balf. f. et Ward, and *Rh. psilostylum*, Balf. f. But *Rh. chryseum* has 5–8 stamens; *Rh. muliense* has 10 stamens. *Rh. psilostylum* has a calyx with orbicular lobes; *Rh. muliense* has a calyx with oblong or ovate lobes.

The species is a distinct one. Its nearest ally seems to be *Rh. psilostylum* from which other distinguishing characters shown by it are:—the scales of the upper leaf-surface are not scintillating and full of secretion, the deeply crenulate fringed corolla-lobes, stamens shorter than corolla, gynaeceum equalling in length not longer than corolla, ovary pilose and hair-crested as well as lepidote, style puberulous not glabrous.

It is not yet possible to say a final word upon the differ-

entiation of species amongst those yellow-flowered Lapponicums. My knowledge of them at this time leads me to differentiate the five species named in the preceding lines—*Rh. psilostylum* being the plant diagnosed by Rehder and Wilson as *Rh. flavidum* var. *psilostylum*. We have at Edinburgh a plant under Wilson's number 1202 which therefore ought to be the *Rh. flavidum* of the Plantae Wilsonianae, but which is certainly not *Rh. flavidum* of Franchet nor yet *Rh. primulinum* of Hemsley. It has now flower-buds for the first time. Until they expand and the plant can be assigned its right place a discussion of the relationships in the series would be premature.

Rhododendron orthocladum,* Balf. f. et Forrest.†

A small densely but not intricately branched shrub about 1 m. high with straight ascending divaricate twiggy branches. Branches of the year not 1 mm. in diameter densely scurfy with overlapping ferruginous and pale-green intermixed peltate scales which remain more or less as small warts on the blackening older twigs which soon decorticate. Foliage-buds very small ovoid enclosed in a few lepidote and ciliate scale-leaves. Leaves petiolate as much as 1.5 cm. long persisting for 2 or 3 years; lamina coriaceous linear-lanceolate slightly narrowed at both ends as much as 1.4 cm. long 3 mm. broad, apex obtuse and mucronulate, margin flat or slightly recurved, when young distantly ciliate with long hairs erectly branched from above the middle the branches thin and sharp-pointed, when older obscurely notched by the scars of the fallen hairs, base obtuse or cuneate; upper surface grey-green lepidote with contiguous and overlapping

* *ὀρθός*, straight—in allusion to the form of the branches.

† *Rhododendron orthocladum*, Balf. f. et Forrest.—Frutex nanus ad 1 m. altus. Rami stricti divaricati haud intricati, hornotini porriginosi squamis peltatis imbricatis ferrugineis et albido-viridibus intermixtis vestiti. Folia petiolata ad 1.5 cm. longa; lamina coriacea lineari-lanceolata ad 1.4 cm. longa 3 mm. lata, obtusa mucronulata, margine subrecurva nunc sparsim ciliata nunc crenulis pilorum delapsorum aspera, basi obtusa vel cuneata; supra grisea squamis imbricatis albidis siccis induta, costa media sulcata; subtus plus minusve pallide fulva punctulatim lepidota squamis contiguis imbricatis aliis albido-viridibus stratum quasi-inferum formantibus aliis paucioribus brunneis e strato infero emergentibus, costa media prominula; petiolus circ. 1 mm. longus lepidotus. Flores in umbellam 1–3-floram terminalem dispositi; pedicelli breves circ. 3 mm. longi imbricatim albido-lepidoti. Calyx minutus circ. 1 mm. longus lobos 5 semi-lunatos obscuros margine ciliatos gerens, extus dense lepidotus. Corolla lavandulacea ad 1 cm. longa extus sparsim lepidota epilosa; tubus circ. 2 mm. longus ad os pubescens postice basi aurantiaco-variculatus; lobi 5 elliptici vel oblongi. Stamina 10 corolla breviora; filamenta albida basi aurantica et villosa; antherae rubrae. Discus puberulus. Gynaeceum staminibus brevius; ovarium circ. 1.5 mm. longum conoideum truncatum imbricatim albido-lepidotum; stylus glaber ruber; stigma purpureum. Capsula ovoidea circ. 3.5 cm. longa squamis peltatis siccis vestita, ab apice valvis 5 dehiscens.

whitish or greenish-white uniform scales close-pressed to the surface, each scale with a membranous fringe usually broader than the umbo which has a slight yellowish tint, midrib grooved, veins invisible ; under surface somewhat tawny darker or lighter and punctulate with a slightly raised midrib and concealed veins everywhere lepidote with contiguous overlapping biform scales, most uncoloured like those of upper surface, fewer dark brown on longer stalks and slightly projecting above the others their umbo infiltrated with red secretion, in oldest leaves more of the scales become infiltrated and the surface is more uniform ; petiole about 1 mm. long punctulate lepidote. Flowers in 1–3-flowered terminal umbels ; outer bracts chestnut-brown ovate keeled acute mucronate lepidote outside, inside near apex sericeous, ciliate and at the top the hairs dense and lanate ; innermost bracts membranous obovate-spathulate about 7 mm. long 3 mm. broad, with rounded mucronulate apex clad like the outer bracts ; pedicels about 2–3 mm. long densely imbricately whitely lepidote. Calyx minute barely 1 mm. long composed of a saucer-like cup spreading more or less horizontally 5-lobulate at the margin the lobules semi-lunate, the whole imbricate lepidote outside, the lobules more or less ciliate. Corolla lavender with a whitish centre about 1 cm. long sparingly lepidote and epilose outside ; tube about 2 mm. long villous at the throat with an orange blotch at the base posteriorly ; limb explanate 5-lobed ; lobes elliptic or oblong-elliptic rounded at apex slightly crenulate about 6 mm. long 5 mm. broad. Stamens 10 alternately longer and shorter, longer about 7 mm. long shorter about 5.5 mm., all shorter than corolla ; filaments white slightly widening to base which is orange-coloured, immediately above the naked base is a villous tuft within the corolla-tube ; anthers bright red. Disk puberulous at top below ovary. Gynaeceum about 5 mm. long shorter than stamens ; ovary conoid truncate grooved about 1.5 mm. long densely imbricately lepidote with colourless scales epilose ; style glabrous red clavate at the purple tip bearing the lobulate slightly lipped stigma. Capsule 3.5 mm. long ovoid brown and grizzly with dried peltate scales, dehiscing to the base by 5 valves.

E.N.-W.-Yunnan. Mountains in the N.E. of the Yangtze bend. Lat. 27° 45′ N. Alt. 11,000–12,000 ft. Open situations on ledges of limestone cliffs. Shrub of 2–4 ft. In fruit. G. Forrest. No. 10,481. July 1913.

This species of the Lapponicum series was gathered in fruit by Forrest in 1913. The specimens suggested its affinity with *Rh. telmateium*, Balf. f. et W. W. Sm., from the Chungtien plateau, but its method of branching with straight short twiggy shoots not intricately interwoven, its larger and more densely

set leaves, and its short style prevented its inclusion in *Rh. telmateium* and seemed to indicate that we had here a distinct species. Plants which flowered in 1918 at Caerhays Castle and also at Kew—and I am indebted to Mr. Williams and to the Director of Kew for trusses—supply conclusive evidence of its specific distinction. It gives promise of being one of the most attractive garden plants of the Lapponicum series. In the series its position is without doubt near *Rh. telmateium*—one of the subseries with contiguous scales in the under-leaf indumentum and punctulate with some darker scales. In addition to characters of difference from *Rh. telmateium* already mentioned there is the 1–3-flowered inflorescence not a solitary terminal flower, the calyx is very much smaller, the corolla has an orange blotch in the tube, constantly 10 stamens with the filaments not purple but white with orange-coloured base.

4513 **Rhododendron perulatum,*** Balf. f. et Forrest.†

Shrub about 1 m. high with thickish straight branches retaining for several years the dried scale-leaves of the foliage-buds. Branchlets a year old about 3 mm. in diameter densely tomentose with a persistent matted indumentum of long-stalked floccose hairs and stalked red glands, the indumentum persisting for several years on the branches as a white stratum; branches not nodulose. Outer leaf-scales of the foliage-bud crustaceous brown 1 or more cm. long 4 mm. more or less broad, acuminately tailed from a rounded base carinate whitely tomentose with interlocking hairs on the back and more or less glandular especially about the keel, margin ciliate with short-stalked fasciate hairs, inside glabrous or slightly puberulous, tail often

* *perula*, the scale-leaf of a leaf-bud—in allusion to the persistent scale-leaves of the foliage-bud.

† *Rhododendron perulatum*, Balf. f. et Forrest.—Frutex nanus ad 1 m. altus. Rami stricti subcrassi **per annos plures perulati, annotini circ. 3 mm. diam.** indumento persistente primum rubro demum albescente pilorum floccosorum et glandularum induti. Folia petiolata ad 9 cm. longa; lamina coriacea rigida lanceolata vel oblanceolata circ. 8.5 cm. longa 1.4 cm. lata sursum angustata mucrone conspicuo coronata, margine revoluta, basi subcuneata; supra olivacea opaca paullo rugulosa glabrescens sed pilorum juvenilium vestigiis notata, costa media sulcata sulco puberulo; subtus opaca fulva indumento persistente bistrato ubique induta strati superi pilis elongatis multi-ramosis curvatis intertextis, strati inferi pilis rosulatis breviter ramosis; **petiolus circ. 5 mm. longus glanduloso-tomentosus. Umbella pauciflora**; pedicelli circ. 1.7 cm. longi glanduloso-pubescentes. Calyx subfoliaceus 1 cm. longus 5-lobus; cupula parva circ. 1 mm. longa extus glanduloso-floccosa; lobi 5 oblongi rosei vel aurantiaci extus glabri ciliati. Corolla rosea tubuloso-campanulata emaculata ad 3.5 cm. longa; lobi emarginati. Stamina 10 inaequalia corolla breviora; filamenta puberula. Discus puberulus. Gynaeceum circ. 2.8 cm. longum corolla brevius staminibus longius; ovarium elongato-ovoideum sulcatum dense glandulosum et pubescens **superne subcristatum; stylus basi puberulus.**

equalling the base enveloped in white tomentum like that on keel; innermost bracts membranous greenish-yellow ligulate-spathulate about 2.7 cm. long and 6 mm. broad, apiculate glabrous inside, outside woolly tomentose like outer bracts and the apiculus completely enwrapped in brown hairs, margin ciliate with stalked besom-hairs; young leaf in bud revolute, on both sides densely tomentose hairs with stout stalks and much-branched curling and intertwining, those of upper surface deciduous at expansion. Leaves shortly petiolate as much as 9 cm. long; lamina thickly leathery rigid lanceolate or oblanceolate as much as 8.5 cm. long and 1.4 cm. broad narrowing to the acute apex where is a conspicuous hydathodal mucro, margin cartilaginous prominently revolute, long-tapered to narrow wedge-shaped base; upper surface dark olive-green opaque shagreened clad with obscure vestiges of juvenile hairs, midrib grooved, groove lined with hairs, primary veins about 14 on each side obscure; under surface with an elevated midrib, the rest of the venation hidden, dull tawny-coloured completely covered by a loose-surfaced bistrate indumentum, lower stratum of rosette-hairs with few broad short vesicular arms patent uncoloured, upper stratum of stoutly-stalked much-branched hairs with long or short axis the branches of broad vesicular long cells with thin walls not terete and not curling tendrilwise but interlocking; petiole about 5 mm. long grooved above, densely tomentose and glandular like the branchlets. Inflorescence (few-flowered) and bracts and bracteoles unknown; pedicel about 1.7 cm. long glandular and pubescent. Calyx foliaceous pink or orange-coloured as much as 1 cm. long; cup fleshy about 1 mm. long outside more or less glandular and floccose-puberulous; lobes oblong or oblong-oval glabrous outside and inside with some marginal cilia, reflexing and often falling off and leaving behind a toothed cup. Corolla tubular-campanulate about 3.5 cm. long puberulous at base inside without blotch or spots, slightly 5-gibbous at base, 5-lobed; lobes about 1.2 cm. long 1.8 cm. broad emarginate crenulate. Stamens 10 unequal shorter than corolla, longest about 2.4 cm. long with anther about 2.25 mm. long, shortest about 1.4 cm. long with anther about 1.5 mm. long; filaments widened downwards, from the base puberulous through one-third or one-half the length. Disk most densely puberulous below the ovary. Gynaeceum about 2.8 cm. long a little shorter than corolla a little longer than stamens; ovary elongate ovoid grooved dark-coloured densely covered with intermixed stalked glands (the glands ovoid orange-coloured, the stalk whitish) and long simple hairs, at the top with a crest of erect uncoloured pointed simple hairs; style reddish-coloured at the base with a few straight simple

scattered uncoloured hairs, otherwise glabrous, only slightly expanded below the flat purple lobulate lipped stigma.

S.E. Tibet. Tsarong. On Doker-la, Mekong-Salween divide. Lat. 28° 20′ N. Alt. 11,000 ft. Open rocky slopes by streams. Shrub of 2–4 ft. Flowers pale rose without markings. G. Forrest. No. 14,421. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 30′ N. Alt. 14,000 ft. On bouldery slopes. Shrub of 3 ft. Flowers deep rose without markings. G. Forrest. No. 14,513. Aug. 1917.

This plant has affinity with the Roxieanum series. Its nearest ally is *Rh. comisteum*, Balf. f. et Forrest, from which it differs amongst other characters by its unspotted corolla; glandular and tomentose not merely tomentose pedicels and ovary; style pilose at base not glabrous. It is like *Rh. comisteum* in indumentum which differs from that of *Rh. Roxieanum* and its immediate allies in having the branches of the interlocking hairs broad thin-walled vesicular and collapsing not cord-like and tendrillar.

Rhododendron porphyrophyllum,* Balf. f. et Forrest.†

A creeping woody undershrub a few centimeters high or reaching half a meter rooting freely from the stem, the stems at first thin often only 2 mm. in diameter densely clad with cinnamon-coloured woolly tomentum which persists for several years, showing short annual growths about 1 cm. long producing about 5 foliage-leaves at the top and densely clad with the persistent sharp-pointed outer scale-leaves of the foliage-bud, older stem thick hard woody with a grey decorticating soft bark. Outer scale-leaves of the foliage-bud lanceolate-acuminate from the

* πόρφυρος, purple—in allusion to the colour of the under surface of the leaf.

† *Rhododendron porphyrophyllum*, Balf. f. et Forrest.—Suffrutex humilis repens e ramis radicans. Ramuli cinnamomeo-tomentosi alabastrorum perulis extimis persistentibus vestiti. Folia petiolata ad 6 cm. longa; lamina crasse coriacea oblanceolata ad 5 cm. longa 1.5 cm. lata breviter mucronulata margine revoluta, basi obtusa in alam angustam petiolarem prolongata; supra atroviridis opaca reticulata costa media venisque omnibus sulcatis, glabrescens sed pilorum juvenilium vestigiis notata; infra intense rubropurpurea costa media elevata venis caeteroquin obscuris ubique indumento tenui bistrato demum detersili vestita, pilis strati superi rufo-tinctis longe stipitatis multi-ramosis, strati inferi rosulatis breviter ramosis; petiolus crassus lanato-tomentosus ad 1 cm. longus. Flores solitarii terminales basi bracteis intimis paucis membranaceis pubescentibus ciliatis stramineis et rufo-tinctis sub anthesi persistentibus cincti; pedicelli ad 1.8 cm. longi dense floccosi. Calyx parvus 5-lobus; lobi carnei extus glabri floccoso-ciliati. Corolla tubuloso-campanulata circ. 4 cm. longa extus glabra, intus puberula 5-loba; lobi rotundati. Discus puberulus. Gynaeceum corolla brevius; ovarium cylindrico-conoideum circ. 4.5 mm. longum pilis fasciatis crassis dense vestitum eglandulosum; stylus glaber.

base keeled pink when young becoming brown and crustaceous more or less puberulous on back with many branched rufous hairs around the acuminate tip, floccosely ciliate; innermost scales thin membranous yellowish often as much as 2 cm. long ligulate-spathulate acuminate; young leaves in the bud revolute, upper surface covered with floccose hairs falling as the leaf expands, under surface densely tomentose. Leaves petiolate as much as 6 cm. long; lamina thickly leathery oblanceolate or lanceolate or oval or oblong as much as 5 cm. long 1.5 cm. broad obtuse with a short conspicuous red tuberculate hydathodal mucro, margin revolute, base tapered to narrow wings running into the petiole; upper surface dark green mat reticulate and shagreened glabrescent but marked by bases of fallen juvenile floccose hairs, midrib grooved and lined by withered vestiges of hairs, primary veins some 13 on each side grooved as are the ultimate veinlets; under surface purple or magenta-red, midrib raised, rest of venation obscured, the whole surface covered with a thin loose bistrate indumentum of slightly tinted brownish hairs through which the red epidermal surface shows, hairs of the upper stratum with long stems branching freely the branches cylindric and pointed, under stratum of rosette short-branched hairs, whole indumentum detersile leaving the red epidermal surface naked or showing a few hairs on or about the midrib; petiole stout lanately tomentose as much as 1 cm. long often less. Flowers solitary at the end of the branches (? always); outer bracts crustaceous apiculate or tailed from an ovate base tomentose on back, floccose-fringed, innermost bracts more or less membranous yellow oblong-spathulate or obovate rounded at apex more or less mucronulate as much as 2.2 cm. long and 1.2 cm. broad densely pubescent outside and inside towards the top, ciliate, persistent during flowering; bracteoles unknown; pedicels about 1.8 cm. long densely floccose. Calyx small fleshy 5-lobed about 1.5 mm. long; lobes rounded glabrous outside, flock-fringed. Corolla tubular-campanulate deep rose-coloured unspotted about 4 cm. long; tube glabrous outside, puberulous inside, fleshy 5-gibbous and retuse 5-lobed; lobes rounded about 1.3 cm. long 1.5 cm. broad. Stamens unknown. Disk puberulous below ovary. Gynaeceum shorter than corolla; ovary cylindrico-conoid about 4.5 mm. long grooved tomentose with fasciate upwardly curved hairs of few stout thick-walled branches; style glabrous.

S.E. Tibet. Tsarong. On Ka-gwr-pw. Lat. 28° 40′ N. Alt. 13,000 ft. Open stony alpine pasture. Creeping shrub of 2–6 in. Flowers deep rose without markings. G. Forrest. No. 16,695. June 1918. (Duplicate of 1917 in foliage.)

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N.

Alt. 13,000 ft. On ledges of cliffs. Shrub of 2 ft. G. Forrest. No. 14,293. July 1917.

This is a delightful species of the Forrestii series a specimen of which with flower has come to Mr. J. C. Williams, Caerhays Castle, in a postal packet, one of the first-fruits of Forrest's exploration during the year 1918. It is the same as Forrest's No. 14,293 of his 1917 collection which is evidently the duplicate in foliage to which he refers on the ticket of 16,695. Its conspicuous features are :—the elongated oblanceolate to oblong leaves showing purple-red under surface with thin bistrate indumentum of long branched hairs and smaller rosette-hairs without any glands, more or less detersile ; densely floccose eglandular pedicels, calyx, and ovary ; large corolla ; puberulous disk. I look upon the red under surface of the leaves of this species as indicating the persistence of a juvenile character now fixed as a specific character of the adult, an explanation which is also put forward in the case of *Rh. Forrestii* (see p. 119).

U815 **Rhododendron recurvum,** Balf. f. et Forrest.*

Shrub as much as 3 m. high with stout branches showing short annual growths and bearing for many years the persistent scale-leaves of the foliage-buds. Branchlets a year old about 6 mm. in diameter completely enwrapped in a thick woolly rufous orange-coloured bistrate indumentum of an upper stratum of long

* *Rhododendron recurvum,* Balf. f. et Forrest.—Frutex ad 3 m. altus. Rami **crassi alabastrorum perulis persistentibus vestiti, hornotini circ. 6 mm. diam.** indumento crasso lanato rufo-aurantiaco bistrato persistente involuti eglandulosi. Perulae extimae crustaceae brunneae a basi ovata vel rotundata caudatae, glandulis et pilis sebaceis floccosis vestitae, intimae pallide flavae late ligulato-spathulatae breviter apiculatae **extus glandulosae et puberulae, ciliatae ; folia juvenilia revoluta supra pilosa et glandulosa. Folia petiolata ad 10 cm. longa** per annos plurimos persistentia ; lamina circ. 9 cm. longa 1.7 cm. lata acuta vel acuminata **mucronata, margine** revoluta, deorsum attenuata in petiolum prolongata ; supra olivacea subrugulosa subnitens glabrescens sed pilorum glandularumque vestigiis notata, costa media profunde sulcata pilis vestigialibus referta ; **infra rufo-aurantiaca indumento crasso persistente** bistrato ubique vestita, pilis strati superi tendrilliformibus, pilis strati inferi rosulatis ; petiolus circ. 1 cm. longus ut rami indutus. Flores in racemoso-umbellam circ. 20-floram dispositi bracteis cincti, **rhachi** pubescente ; bracteae persistentes extimae lignosae subulatae, interiores rotundatae vel ovatae coriaceae caudatae vel apiculatae plus minusve tomentosae, intimae membranaceae spathulatae vel obovatae molliter tomentosae; bracteolae breves filiformes ; pedicelli circ. 2 cm. longi crassi glandulosi et puberuli. Calyx parvulus circ. 1 mm. longus 5-lobus glandulosus et puberulus, pilis glandulisque ciliatus. Corolla alba roseo-suffusa sparsim maculata evariculosa circ. 2.8 cm. longa ; tubus infundibuliformis ; lobi circ. 1 cm. longi 1.4 cm. lati emarginati. Stamina 10 inaequalia corolla breviora ; filamenta crassa deorsum dilatata puberula. Discus dense puberulus. **Gynaeceum circ. 2 cm. longum corolla brevius staminibus longius ; ovarium cylindrico-conoideum truncatum circ. 4 mm. longum dense glandulosum ; stylus glaber.**

much-branched hairs the branches twining and interweaving and a substratum of colourless rosette-hairs with short vesicular branches, eglandular, the indumentum present for many years becoming grey and blackening on the spongy bark ; outermost perulae of the foliage-bud crustaceous brown with an ovate or rounded cucullate base and a long tail much longer than base, inner surface more or less glandular (particularly over upper part of midrib) with red ovoid shortly-stalked glands intermixed with sebaceous floccose white or reddening hairs, margin beautifully ciliate with besom-like floccose hairs, these glands and hairs cover the outside and enwrap densely the tail ; intermediate scale-leaves with broader and larger base and the tail reduced to an apiculus, edge somewhat thinner, thence through more obovate forms to the innermost perulae which are pale yellow about 2.8 cm. long 4 mm. broad ligulate-spathulate shortly apiculate glandular and puberulous outside and with a ciliate margin ; young leaves with revolute ptyxis, upper surface pubescent with floccose hairs nearly sessile and branched from the base in long unicellular ascending straight or slightly curling pointed colourless threads intermixed with stout-stalked clavate orange-coloured or red glands, upper indumentum soon falling ; under surface densely woolly with bright red-orange-coloured bistrate persistent indumentum like that of branches (the long interwoven hairs having perhaps shorter stalks). Leaves petiolate as much as 10 cm. long persistent for several years and forming close-set tufts at the ends of the branches ; lamina rigid thickly leathery narrowly lanceolate or oblanceolate as much as 9 cm. long and 1.7 cm. broad tapered to the acute or shortly acuminate apex and ending in a conspicuous hydathodal red mucro, margin strongly recurved, gradually tapered to the base where it passes into the broad petiole as a slight wing ; upper surface olive-green glossy as if varnished somewhat shagreened apparently glabrous but showing vestiges of the fallen juvenile hairs and glands, midrib deeply grooved, groove lined with vestigial juvenile floccose hairs and an occasional gland, the primary veins as many as 18 on each side slightly grooved ; under surface rufous-orange-coloured from a thick woolly indumentum covering the raised midrib (where the coloration is sometimes paler even grey-white) and hiding the rest of the venation, indumentum persistent bistrate of elements like those of the branches, the upper-stratum hairs thick-walled and curling tendrilwise, the under stratum of rosette-hairs many-branched but not forming a conspicuous layer ; petiole about 1 cm. long enwrapped in an indumentum (like that of the branches) as thick as itself, with the indumental cover it is broader than the base of the lamina. Flowers in a terminal racemose umbel enclosed in the bracts

which persist during flowering, as many as 20 flowers in the inflorescence, rhachis pubescent above with white straight hairs, below tomentose with long woolly hairs; bracts outermost woody subulate from a narrow base followed by rounded and ovate coriaceous with thinner margin keeled tailed or apiculate 1.5–2 cm. long and 7–10 mm. broad glabrous inside save at top where are silky adpressed hairs, outside more or less tomentose with floccose rufous-orange-coloured hairs, tail or apiculus completely enwrapped in the tomentum; inner fertile bracts membranous spathulate or obovate with rounded or truncate apiculate apex as much as 2.5 cm. long and 7 mm. broad softly hairy with white or rufous tomentum more or less over whole outer and inner surfaces and on margin and summit; bracteoles much shorter than pedicels about 0.5 cm. long filiform adpressed pilose with white hairs, hair-crested; pedicels as much as 2 cm. long stout expanded below the calyx, glandular with shortly stalked ovoid red glands also puberulous with simple hairs. Calyx very small a little over 1 mm. long cut to the base into 5 rounded lobes, whole calyx more or less glandular and puberulous outside, margin of lobes gland-fringed and ciliate. Corolla white flushed rose outside with a few posterior crimson spots without a blotch about 2.8 cm. long with a funnel-shaped tube narrow cylindric at base slightly curved thickened and 5-gibbous, puberulous inside, glabrous outside, expanding into a 5-lobed limb; lobes about 1 cm. long and 1.4 cm. broad thin emarginate crenulate. Stamens 10 unequal shorter than corolla, longest about 1.7 cm. long with anther 2 mm. long, shortest about 1 cm. long with anther 1.5 mm. long; filaments stout expanded downwards, from the base upward to about the middle finely puberulous. Disk large densely puberulous. Gynaeceum about 2 cm. long shorter than corolla longer than stamens; ovary cylindrico-conoid truncate about 4 mm. long grooved densely glandular with ovoid orange-coloured short-stalked glands; style pale-coloured glabrous hardly expanded below the much broader dark-coloured discoid lobulate lipped stigma.

E.N.-W.-Yunnan. Mountains in the N.E. of the Yangtze bend. Boulder-strewn slopes. Alt. 11,000–12,000 ft. Lat. 27° 45′ N. Shrub of 4–6 ft. Flowers white flushed rose on exterior. G. Forrest. No. 10,540. July 1913.

E.N.-W.-Yunnan. Mountains in the N.E. of the Yangtze bend. In open thickets. Alt. 10,000 ft. Lat. 27° 45′ N. Shrub of 8–10 ft. Flowers rose? G. Forrest. No. 10,991. Aug. 1913.

N.W. Yunnan. Kari Pass, Mekong-Yangtze divide. Open stony pastures. Alt. 12,000–13,000 ft. Lat. 27° 40′ N. Flowers rose. G. Forrest. No. 12,947. July 1914.

Rh. recurvum is in cultivation raised from seed of Forrest's No. 10,540.

This species has been confused hitherto with *Rh. Roxieanum*, G. Forrest. In habit and general form they are much alike but in addition to minor marks of distinction the easily-recognised points of difference are:—*Rh. recurvum* has funnel-shaped corolla, a glandular and puberulous pedicel and calyx and a glandular ovary. *Rh. Roxieanum* has campanulate corolla, a tomentose pedicel, a finely puberulous calyx and a tomentose ovary and in all these parts has no such glands as occur in the other species. Judging by the specimens obtained by Forrest *Rh. recurvum* is the commoner species, and extends over the eastern area of N.W. Yunnan from the Kari Pass to the Chung-tien Plateau. Over this area it assumes in the highest district a more dwarf habit and all its parts become much smaller. One set of Forrest's specimens, No. 13,005, presents us with a plant so different in appearance one might readily take it for a distinct species. The leaves are linear 5 cm. or less long and about 5 mm. broad recalling in a measure but for their pointed tips the foliage of *Rh. proteoides*, Balf. f. et W. W. Sm.; the reduction in size of parts appears also in the flower which shows greater curvature and irregularity. No really diagnostic specific characters are to be found and one must regard this as an alpine dwarf state of *Rh. recurvum*—var. *oreonastes*, if you please. In support of this Forrest's specimen with the label "Bei-ma-shan. Open situations amongst rocks. Alt. 12,000 ft. Lat. 28° 30′ N. Shrub 3–4 ft. No. 13,536. Sept. 1914" shows us a form slightly larger than the alpine form and indicating as it were a transition to the alpine from the lower altitudes:—

4516 **Rhododendron recurvum,** Balf. f. et Forrest, var. **oreonastes**, Balf. f. et Forrest.

Pedicels as much as 1.5 cm. long glandular with short-stalked ovoid orange-coloured glands and puberulous, obliquely expanded below the flower; bracteole much shorter than pedicel about 5 mm. long filiform densely pilose outside with curled white hairs apex hair-crested. Calyx a very small fleshy cup barely 1 mm. long showing 5 minute marginal teeth, whole calyx glandular and puberulous outside. Corolla about 2.5 cm. long with a funnel-shaped tube about half its length, glabrous outside, puberulous inside, fleshy and prominently 5-gibbous at base expanding into a deflexed 5-lobed limb; lobes unequal, posterior largest about 1 cm. long and 1.4 cm. broad rounded thin crenulate emarginate. Stamens 10 unequal, longest about 1.8 cm. long with anther 2 mm. long, shortest about 1 cm. long with anther about 1.5 mm. long; filaments

slightly expanded downwards, from the base finely puberulous upwards sometimes to about the middle in the shorter stamens. Disk very large and puberulous. Gynaeceum about 2.3 cm. long; ovary cylindric about 3 mm. long truncate slightly grooved densely glandular, glands ovoid orange-coloured with white stalks; style stout glabrous lipped below the discoid large lobulate stigma wider than style.

N.W. Yunnan. Kari Pass, Mekong-Yangtze divide. Open stony pastures. Alt. 14,000 ft. Lat. 27° 40′ N. Shrub of 2 ft. G. Forrest. No. 13,005. Aug. 1914.

4917 **Rhododendron Reginaldi,*** Balf. f.†

Pyramidal bush or round-headed tree over 4 m. high spreading profusely. Foliage-buds narrowly ovoid pointed about 1.2 cm. long and 6 mm. broad; outer scale-leaves crustaceous rounded apiculate glabrous save for a few cilia and some short hairs inside at top; inner scale-leaves not sticky oval obtuse puberulous outside 1 cm. long 5 cm. broad ciliate; innermost membranous forming chamber for the young revolute foliage-leaves the upper surface of which is glandular. Leaves petiolate as much as 10 cm. long; lamina leathery oblong, at first expansion coated above with many long white twisted hairs and a few long-stalked glands and having the margin gland-ciliate, the petiole above glandular and hairy and the midrib glandular, at maturity most glabrous, apex rounded shortly apiculate, margin entire slightly cartilaginous and recurving, base broadly cuneate; upper surface opaque with slightly grooved midrib, primary veins as many as 17 on each side pinnately spreading and close set; under surface paler somewhat grey-green with prominent lighter-coloured midrib, the primary veins hardly visible, the ultimate reticulation of the venation conspicuous but not elevated; petiole as much as 2 cm. long grooved above quite glabrous. (In seedling the

* **After its discoverer, Reginald Farrer.**

† *Rhododendron Reginaldi*, Balf. f.—Arbor parva ad 4 m. alta late patens. Alabastra anguste ovoidea acuta; perulae extimae glabrae margine ciliato excepto, intimae ovatae haud glutinosae; **folia juvenilia revoluta supra pilosa et glandulosa.** Folia petiolata ad 10 cm. longa; lamina oblonga ad maturitatem glabra coriacea ad 8 cm. longa 3 cm. lata **apice rotundata breviter apiculata margine** integra recurva basi late cuneata; supra opaca viridis costa media paullo sulcata, venis primariis utrinsecus ad 17 pinnatim patentibus; infra pallidior costa media prominula; petiolus circ. 2 cm. longus glaber. Flores in umbellam racemosam circ. 7-floram dispositi; bracteolae circ. 5 mm. longae pilosae; pedicelli breves circ. 8 mm. longi rubro-glandulosi. Calyx obsoletus. Corolla pallide rosea variculosa et maculata infundibuliformis, circ. 4.5 cm. longa, 7-loba; lobi rotundati circ. 1.4 cm. longa 1.8 cm. lata. Stamina 14 inaequalia corolla gynaeceoque breviora; filamenta cylindrica minute puberula. Discus glaber. Gynaeceum circ. 3.4 cm. **longum corollam subaequans; ovarium cylindrico-conoideum truncatum** circ. 5.5 mm. longum glabrum; stylus glaber.

under-leaf surface deep red; the upper surface also often red-veined). Flowers in a few-flowered (7) shortly racemose umbel, rhachis not 1 cm. long; bracts unknown; bracteoles filiform about 5 mm. long shorter than pedicel adpressedly pilose hair-crested; pedicel short about 8 mm. long gradually expanding below the calyx to which it is slightly oblique, glandular the glands red ovoid on short stalks. Calyx obsolete showing only some point-like teeth on the margin of a fleshy rim. Corolla funnel-shaped about 4.5 cm. long pale pink with evidently a posterior darker blotch and some crimson spots, not gibbous at the base, glabrous inside and outside 7-lobed; lobes rounded about 1.4 cm. long 1.8 cm. broad emarginate hardly crenulate. Stamens 14 unequal shorter than corolla and gynaeceum, longest about 3.3 cm. long with anther 3 mm. long, shortest about 2 cm. long with anther 2.5 mm. long; filaments cylindric not widened to base, very finely puberulous for a short distance at very base; anthers oblong fat as much as 1.5 mm. in diameter. Disk glabrous small. Gynaeceum about 3.4 cm. long about equal to the stamens; ovary cylindrico-conoid truncate about 5.5 mm. long deeply grooved glabrous; style glabrous slightly expanding at top under the flat lobulate stigma.

S. Kansu. "Only seen above 9000 ft. in one series of wooded or coppiced mountain glens on the 10,000-ft. range intervening between the main chains of Siku and Satanee, *not* (for once) on limestone, but on a red shale. A comely pyramidal bush or round-headed tree of 12–15 ft., exceedingly profuse, with lovely pale-pink flowers." Farrer. No. 63. May 12, 1914.

A distinct species of the series of Eurhododendrons which have 7-lobed corollas, 14 stamens, glabrous ovary and style, and in which the leaves are at maturity glabrous everywhere.

4515

Rhododendron repens, Balf. f. et Forrest.*

Creeping under-shrub rising 5–10 cm. above the ground of slow growth forming gnarled woody stems, annual increments rarely

* *Rhododendron repens*, Balf. f. et Forrest.—Suffrutex repens ad 10 cm. altus. Rami ultimi breves glandulosi alabastrorum perulis persistentibus vestiti folia 5 rosulata apicalia gerentes. Folia petiolata ad 3.5 cm. longa 2 cm. lata saepe minora crasse coriacea rigida obovata nunc oblonga nunc elliptica mucronulata, margine recurva subaspera, basi obtusa vel in petiolum attenuata; supra subrugulosa glabrescentia; subtus pallide viridia vel glauca demum saepe olivacea venulis reticulatis subelevatis paullo rubro-tinctis glandulosis epilosis. Flores solitarii terminales basi bracteis intimis flavidis sub anthesi cincti; pedicelli ad 2 cm. longi dense glandulosi et floccoso-tomentosi. Calyx ad 3 mm. longus in lobos 5 fissus; lobi ovati acuti submembranacei extus glabri margine glanduloso-ciliati. Corolla laete kermesina tubuloso-campanulata; lobi lati emarginati crenulati. Stamina 10 subaequalia, corolla et gynaeceo breviora; filamenta glabra. Discus puberulus. Gynaeceum corolla brevius stamina subaequans; ovarium circ. 4 mm. longum floccoso-tomentosum; stylus glaber. Capsula paullo curvata longa (ad 2.5 cm.) vel brevis (circ. 1 cm.). Semina exalata ecristata.

1 cm. long (except for an occasional water-shoot about 4 cm. long) and producing at most some 5 foliage-leaves in a rosette, outer scale-leaves of the foliage-bud persistent below the leaves and for many years. Branchlets a year old about 1.5 mm. in diameter pinkish or red and glandular with short-stalked capitate red glands, ultimately becoming grey and decorticating. Foliage-buds ovate rufous-brown; outer scales chartaceous lanceolate acuminate from the base, keeled ciliate otherwise glabrous about 9 mm. long and 1.5 mm. broad; innermost ligulate-spathulate yellowish more membranous and longer; young leaf in the bud revolute, upper surface entirely clad with chestnut-coloured short floccose hairs, upper margin of petiole clad likewise, its under surface red glandular. Leaves petiolate variable in size as much as 3.5 cm. long or as little as 1 cm., persisting for some three years clustered (3–5) at the end of the annual growths; lamina leathery rigid obovate oblong or elliptic varying much in size from 8 mm. long by 6 mm. broad to 3 cm. long by 2 cm. broad, apex rounded with a tuberculate dark-coloured mucro, margin cartilaginous slightly recurved somewhat erose and roughened by scars of fallen floccose hairs, base obtuse or somewhat cuneately tapered into the petiole; upper surface dark-green opaque showing a deeply grooved midrib with some 8 primary veins on each side which may be hardly visible or may be grooved giving the surface a somewhat bullate aspect, midrib groove is lined by vestiges of floccose hairs and the whole surface pocked by scars of the fallen juvenile hairs; under surface paler green often glaucous or approaching olive-brown colour, midrib and primary veins pinkish and raised, rest of venation appearing as a reddish or brown slightly raised reticulation, red shortly-stalked capitate glands scattered all over the midrib and veins, on the midrib a few floccose hairs also; petiole as much as 8 mm. long usually less, pink or red grooved above and floccose above, glandular beneath. Flowers solitary terminal to the branches (I have seen once two flowers at the end of a shoot), base of pedicel enclosed by bracts during flowering; bracts few eglandular eciliate outer ones tinted red chartaceous ovate apiculate, about 8 mm. long and 4 mm. broad or more, followed by oval and then obovate forms as much as 2 cm. long and 1 cm. broad, all glabrous save for a patch of adpressed white hairs at the top outside and inside; bracteoles about 5 mm. long narrowly ligulate glabrous or with an occasional marginal gland; pedicel as much as 2 cm. long densely glandular (with ovoid orange-coloured glands) and with a few setiform greasy reddish unbranched sometimes branched hairs intermixed. Calyx small saucer-shaped as much as 3 mm. long divided to near the base into 5 ovate acute somewhat membranous red gland-fringed lobes

glabrous on the back. Corolla tubular-campanulate crimson about 3.8 cm. long ; tube glabrous outside and inside 5-gibbous retuse fleshy at the base with 5 imperfect interpetaline septa ; lobes 5 rounded about 8 mm. long and 2 cm. broad emarginate and crenulate. Stamens 10 subequal much shorter than corolla, longest about 2 cm. long, shortest about 1.8 cm. long ; filaments dark-crimson at slightly-widened base, glabrous ; anthers rich brown about 2 mm. long. Disk large 1 cm. long puberulous below ovary. Gynaeceum about 2.1 cm. long equalling or slightly longer than stamens ; ovary about 4 mm. long grooved cylindric-conoid truncate densely tomentose with complete cover of floccose greasy pinkish adpressed ascending hairs those at top forming a crest around base of style ; style glabrous hardly swollen at top beneath the lobulate stigma. Capsule as much as 2.5 cm. long and 5 mm. broad (sometimes much smaller) brown faintly bristly or warted slightly oblique to pedicel nearly straight, calyx-cup conspicuous and enlarged at its base, dehiscing from apex by five valves which leave a stylopodar fringe. Seeds small 1.75 mm. long .75 mm. broad without arillar wing or crest, pale brown, testa striate, chalazal end rounded, funicular end truncate minutely fringed.

W.N.-W.-Yunnan. Mekong-Salween divide. On moss-clad boulders and stony moist pasture. Alt. 12,000–14,000 ft. Lat. 28° 20′ N. Creeping shrub of 1–2 in. Flowers bright scarlet crimson. G. Forrest. No. 14,011. June 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Open moist stony pasture. Alt. 12,000–13,000 ft. Lat. 27° 40′ N. Creeping shrub of 2–3 in. Flowers crimson. G. Forrest. No. 14,138. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Open moist stony pasture and on boulders. Alt. 14,000 ft. Lat. 28° 30′ N. Creeping shrub of 1–2 in. Flowers dark crimson. G. Forrest. No. 14,534. Aug. 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. On boulders and cliffs. Alt. 11,000–12,000 ft. Lat. 28° 10′ N. Climbing shrub of 2–3 ft. In fruit. G. Forrest. No. 13,259, Sept. 1914 ; No. 13,442, Oct. 1914.

Rh. repens as displayed in the specimens cited is a plant of the same habit as and in other characters very like *Rh. Forrestii*, Balf. f. The species are very nearly allied. The general appearance of the plants in dried specimens suggests specific difference and confirms the conclusion at which Forrest has arrived from his observation of the plants growing in their habitats. Yet critical consideration of the details of structure shown by the dried specimens raises the question—Have we here one or two species ? And this I propose to discuss.

Rh. Forrestii was discovered by Forrest in 1905 growing in the Tsedjiong Pass on the Mekong-Salween divide in lat. 28° 10′ N. at 10,000–11,000 ft. elevation but owing to the destruction by the Lamas of the greater part of his collections of that year only one fragmentary specimen of the plant reached this country under No. 699—sufficient in the case of so striking a novelty to sanction description as a new species. Two prominent features in the plant at once arrest attention—the small elliptic or slightly obovate leaves with dark almost black-purple under surface and the deep crimson colour of the solitary terminal flowers. In course of the explorations which Forrest has made during the dozen years that have elapsed since the discovery of this plant he had not come across its like again until this year 1918 when he sends home to Mr. J. C. Williams in a postal packet specimens of it under No. 16,689 from a station at a higher altitude a little further south than that of the original find. This sending gives material for a better knowledge of the species—although unfortunately the important fruit is still wanting—and enables me to add to the published description of the species hitherto incomplete.

In the years between 1905 and 1918 Forrest has found the plants cited here under *Rh. repens*. They differ from *Rh. Forrestii* in the arresting characters mentioned. They have larger coarser leaves prominently obovate and pale green not deep black-purple on the under side and the flowers are brighter crimson. Specimens No. 13,259 and 13,442 are in fruit which in 13,259 is twice the length of that in 13,442, but there is no other apparent character of difference and the plants conform generally with the other green-leaved forms. From seeds of No. 13,259 plants have been raised by Mr. J. C. Williams at Caerhays Castle and these plants in specimens presented to us by him have leaves with green under surface like those of the parent. On one plant I found a leaf evidently an early formed one which has a bright-red under surface. This suggests that the seedling leaves in this plant possess this character which is not shown by the leaves produced by the adult. The development of such a type of leaf in the seedling stage is a recognised habit in many Rhododendrons and in "back-breaks" and water-shoots the same seedling type of leaf commonly appears. In Forrest's Tsarong plant from Ka-gwr-pw No. 14,534 I find such a water-shoot. We have then evidence upon which to found satisfactorily the statement that the plant we are calling *Rh. repens* is one of those Rhododendrons which begin life with leaves deeply red or purple-tinted below, and that the coloration is not maintained during its

life after the seedling stage. It has a juvenile stage recognisable by a structural colour-character from an adult stage. This is important for it makes legitimate the putting forward in explanation of the adult-leaf condition of *Rh. Forrestii* that it is a persistent juvenile form. We do not know the seedling state of *Rh. Forrestii* but we cannot doubt that its adult character of leaf-colour will be ascertained to be a continuation of its seedling character.

I have suggested elsewhere * that the anthocyanin coloration of the leaf under-surface in these seedling Rhododendrons probably plays the rôle of heat-regulator. It is conceivable that conditions of the environment might call for the retention of this controlling colouring matter through the later phases of life of the plant, and that in what we are calling *Rh. Forrestii* with its reddened leaves we have only a local casual rendering of a type which normally exhibits the foliage with green under surface of what we are calling *Rh. repens*, that is to say, that we have before us an unstable variation. But that is not the limit of conception in the case. The evidence does not negate the possibility that the leaf-colour originating in this way in a seedling character has become fixed as an adult character and is a constant feature in the plant under consideration. The retention and the final fixing of juvenile character is a well-recognised phenomenon of plant-life affecting structure of deeper moment than mutable possessions like colour-tints even to the degree of differentiating genera. In Convallaria (lily of the valley) for instance we have the permanently juvenile form of Polygonatum (Solomon's seal). In support of the view that *Rh. Forrestii* and *Rh. repens* are specifically distinct and that this leaf-colour is a fixed diagnostic mark three bits of evidence may be brought forward:—

The observations of Forrest—"the man on the spot"—who has been impressed by their difference and has found no intermediate states such as would be likely to occur were the leaf-colour a fluctuating one. His many specimens confirm this. In only one adult twig of his Ka-gwr-pw specimens have I seen a suggestion of tinting on the under-leaf surface.

The fact that the two sets of specimens of *Rh. Forrestii* come from different localities with difference of elevation of 2000 ft. seems to favour the idea of constancy of the leaf-colour character.

In allied species of the Forrestii series which leave no room for questioning of specific identity we find parallel developments. *Rh. erastum*, Balf. f. et Forrest (see p. 60), and *Rh. porphyrophyllum*, Balf. f. et Forrest (see p. 108), supply the

* In Trans. Bot. Soc. Edin., xxvii (1917), 221.

illustration in point. Their specific difference is manifest and their close phyletic relation no less so. All the leaves of *Rh. porphyrophyllum* have dark purple-red under surface, all the leaves of *Rh. erastum* have a green under surface. Although we do not know the seedling state of either of these species their habit and relationships sanction the forecast that in their seedling stage both have leaves red on the under side. *Rh. porphyrophyllum* has retained the juvenile character in its adult state like *Rh. Forrestii*, *Rh. erastum* has parted with it like *Rh. repens*.

For the value of the colour-tint of the flower for diagnosis between *Rh. Forrestii* and *Rh. repens* we must depend upon the observation of Forrest. In the nearly allied series of Rhododendron which centres round *Rh. sanguineum*, Franch., we have colour-tint of much the same depth and intensity as that given by Forrest in this case and it aids in the separation of *Rh. haemaleum*, Balf. f. et Forrest from its near ally *Rh. sanguineum*. So far as dried specimens offer evidence the colour in *Rh. Forrestii* is not so intense as in the darkest of the Sanguineum series. Forrest speaks of the Ka-gwr-pw plants of *Rh. repens* as having dark crimson flowers, which would seem to weaken the value of the colour-tint as a differential mark in the Forrestii series.

Minor marks of difference between *Rh. Forrestii* and *Rh. repens* may be tabulated thus :—

Rh. Forrestii.	*Rh. repens.*
Pedicels glandular.	Pedicels glandular and floccose.
Calyx-lobes fleshy glandular and gland-fringed.	Calyx-lobes glabrous outside, gland-fringed.
Ovary glandular.	Ovary floccose-tomentose.

The characters seem to me to be constant in the two forms respectively and to re-enforce the points of diagnosis already discussed. But in the Ka-gwr-pw plant to which special reference has already been made as a form showing some features not visible in the other specimens of *Rh. repens* the calyx character breaks down—the plant has a glandular calyx—and perhaps others of these characters are not so definitely separating as at first seemed to be the case. Further exploration bringing more specimens will decide. Meanwhile having given as I hope a reasoned interpretation of all the facts in the case I have decided to follow Forrest in taking *Rh. Forrestii* and *Rh. repens* to be distinct species and give now, and for comparison with the description of *Rh. repens*, a fuller account of *Rh. Forrestii* than has been possible hitherto owing to lack of material :—

Rh. Forrestii, Balf. f.* ms., descr. Diels in Notes R.B.G. Edin., v (1912), 211, char. emend.

Woody undershrub climbing over moist moss-covered boulders to which it clings, rooting freely from the stems which are clad for several years with the persistent scale-leaves of the foliage-buds, of slow growth forming annual increments of about 1 cm. in length, producing at most about 5 foliage-leaves in a rosette. Branchlets a year old about 1.5 mm. in diameter pinkish red-glandular becoming grey afterwards before decorticating. Perfect foliage-bud not seen; persistent outer scale-leaves of the bud somewhat crustaceous brown lanceolate-acuminate from the base; innermost scales ligulate-spathulate more membranous about 8 mm. long and 1.5 mm. broad, all with a patch of adpressed hairs towards the top. Leaves petiolate as much as 3 cm. long but often much less persistent for three or four years clustered at the end of the annual growths; lamina leathery rigid obovate as much as 2 cm. long and 1.2 cm. broad, apex rounded with a tuberculate dark-red mucro, margin cartilaginous recurved more or less notched by scars of fallen hairs, base obtuse; upper surface dark-green opaque, midrib and primary veins about 7 on each side grooved giving a slightly bullate aspect, whole surface punctulate by scars of fallen hairs; under surface deep purple-red, midrib and primary veins raised and ultimate reticulation of venation punctulate with glands; petiole as much as 1 cm. long deep purple-red grooved and floccose above, glandular beneath. Flowers solitary at end of the branches, base of pedicel surrounded by the bracts during flowering; bracts few eglandular eciliate, outer purple-tinted chartaceous ovate apiculate about 8 mm. long, innermost membranous pale brown ovate or obovate about 1.8 cm. long, all with adpressed hairs near the top; bracteoles unknown; pedicel strict erect about 1.2 cm. long glandular with red capitate stalked glands, epilose. Calyx

* Diels' description runs :—

Rhododendron Forrestii, Balf. f. ms., descr. Diels.—Frutex scandens 0.9–1.5 m. altus; rami ultimi breves. Folia breviter petiolata, coriacea, obovata, apice minute mucronulata, margine recurva, subtus purpurascentia glandulosa, nervis reticulatis subbullata, 1.5–2 cm. longa, 0.8–1.2 cm. lata, costa subtus prominens. Bracteae summae latissimae, pallidae, apice minute tomentellae. Calyx obsoletus. Corolla intense kermesina, tubus circ. 2 cm. longus sensim ampliatus, limbi lobi suborbiculares.

"Climber of 3–5 ft. Flowers deep crimson. On moist, moss-covered rocks on the ascent of the Tsedjiong Pass, Mekong-Salwin divide. Lat. 28° 10′ N. Alt. 10,000–11,000 ft. June-July 1905. S.E. Tibet." G. Forrest. No. 699.

In habit similar to *R. dendrocharis*, Franch., but distinguished by the glabrous branchlets, the shorter petioles, the leaves being not lepidote, the calyx obsolete, and the corolla-tube longer. I could not examine the stamens and ovary without destroying the specimen.

obsolete showing 5 fleshy rounded lobes hardly .5 mm. long glandular and gland-fringed. Corolla deep crimson about 2.6 cm. long tubular-campanulate ; tube glabrous fleshy 5-gibbous ; lobes rounded. Stamens subequal slightly shorter than gynaeceum, longest 1.9 cm. long ; filaments glabrous dilated to the base. Disk large glabrous about 1.5 mm. long. Gynaeceum about 2.2 cm. long ; ovary about 3.5 mm. long grooved cylindric-conoid densely glandular, glands ovoid stalked, epilose ; style glabrous ; stigma lobulate.

S.E. Tibet. Mekong-Salween divide. On moist moss-covered rocks on the ascent of the Tsedjiong Pass. Alt. 10,000–11,000 ft. Lat. 28° 10′ N. Climber of 3–5 ft. Flowers deep crimson. G. Forrest. No. 699. June-July 1905.

W.N.-W.-Yunnan. Siela Pass, Mekong-Salween divide. Lat. 28° N. Alt. 13,000 ft. G. Forrest. No. 16,689. June 1918. Type. Duplicate of No. 699 (1905).

For several years we knew and only in partial degree of *Rh. Forrestii* as a lovely alpine from S.E. Tibet where it borders on N.W. Yunnan, a solitary species apparently unique in character amongst rhododendrons. Now by his persevering and thorough work of exploration during 1917 and 1918 Forrest reveals to us that *Rh. Forrestii* is only one of a group of forms of which he sends home material that suffices to sanction our describing four new species of every one of which we may say that it has just claims to be considered a rival in beauty of the first-known species of the group. The immediately preceding pages contain my story of *Rh. repens* and on other pages will be found under the names *Rh. erastum* (p. 60), *Rh. porphyrophyllum* (p. 108), and *Rh. serpens*, Balf. f. et Forrest (p. 135), descriptions of other members of the group. Of *Rh. porphyrophyllum* and *Rh. serpens* which have come in specimens by postal packet the material is not abundant but their marks of distinctness are so evident that one cannot hesitate over describing them. Thus we have a small series of rhododendrons centring in the old *Rh. Forrestii* of which the general characters may be briefly stated as :—Creeping undershrubs of low growth rooting freely along the branches which are more or less nodular throughout owing to enlargement of the end of each short annual growth where a cluster of 3–5 foliage-leaves—these more or less persistent for a year or two—are produced whilst rosettes of persistent scale-leaves marking the base of each annual growth clothe the stem more or less densely. The leaves more or less rugulose above sometimes small—recalling those of some of the Lapponicum series or of *Rh. saluenense* and its allies but never possessing the peltate scales of these forms—sometimes larger always with revolute

margins and either glandular on the under surface or glandular with a thin indumentum of hairs but the indumentum never forming a surface concealing the underlying epidermis. Flowers either solitary and terminal or in few-flowered (up to 3) umbels, the inner large sheathing bracts persisting as a sheath around base of the pedicels during flowering. The pedicels always glandular or floccose or both. The calyx not large but the lobes always distinct. The corolla tubular-campanulate large for the plant more or less fleshy crimson of some tint often incompletely septate at base, glabrous inside and outside. Stamens 10 subequal; filaments glabrous or puberulous. Disk large glabrous or puberulous. Gynaeceum slightly longer than stamens shorter than corolla; ovary glandular with long stalked glands or tomentose with fasciate floccose ascending hairs or showing a combination of these; style glabrous.

These characters in brief are given not as defining the series —we do not know enough about it yet—but merely to indicate the run of the development in the members of the series and to suggest the whereabouts of the position of these plants in the now very large genus Rhododendron. They evidently bring *Rh. Forrestii* and its allies into the vicinity of *Rh. sanguineum* which as is explained elsewhere (see p. 81) hinges on to *Rh. haematodes*, to *Rh. floccigerum*, and finally to *Rh. neriiflorum*, of known species. The gynaeceum with its glandular, floccose, or glandular-floccose ovary and the glabrous style, the sequence from solitary to few-flowered trusses in inflorescence, the fleshy more or less campanulate corolla often imperfectly septate of strong colour, the gradation of type of indumentum marking these species seem to bring them together in closer affinity one with another than with other species. For practical working with these rhododendrons the characters named are useful in focussing what appear to be relationships as we endeavour to fix phyletic groups.

The following key based upon the indumentum of under-leaf surface gives easily observed diagnostic marks of the species within the series centring in *Rh. Forrestii* :—

Leaf under-surface deep purple-red.

Leaf under-surface without hairs, glandular on veins . . . . . *Forrestii.*

Leaf under-surface with thin hair-indumentum *porphyrophyllum.*

Leaf under-surface green or glaucous.

Leaf under-surface without hairs, glandular on veins . . . . . *repens.*

Leaf under-surface with tufted detersile hairs along the veins . . . . . *erastum.*

Leaf under-surface uniformly covered with thin brown indumentum . . . . *serpens.*

One further comment :—It has been remarked that the flowers of the West Chinese rhododendrons do not as a rule rival in form, in consistence and in depth and intensity of colour Himalayan species such as *Rh. Thomsoni*, *Rh. fulgens*, *Rh. barbatum* and the like. The Chinese forms we have been considering are certainly evidence to the contrary and to have made known and introduced to our gardens these lovely plants which will be amongst their greatest glories in the future should be some reward to Mr. Forrest for all the labour and hardship of the years he has devoted to the explorations which have secured them.

4819 **Rhododendron roseotinctum,** Balf. f. et Forrest.*

A dwarf shrub not 1 m. high with many thin twiggy short branches at first about 2 mm. in diameter apparently more or less clad with adpressed floccose hairs soon glabrescent, annual growths short 2 cm. or less each crowned by a rosette of 5–6 leaves which do not persist after the second year, stem nodulose at top of successive year's growth, not clothed with persistent outer scale-leaves of foliage-buds, becoming white before decortication. Foliage-buds elongated fusiform pointed ; outer scale-leaves soon deciduous crustaceous with rounded or oblong base keeled ending in a firm tail or apiculus outer surface more or less puberulous with white adpressed branched hairs which also sheathe the apiculus, margin shortly floccose-ciliate ; inner scale-leaves yellow long ligulate-spathulate about 2.5 cm. long 6 mm. broad membranous obtuse or rounded at apex and shortly apiculate outside glabrous below towards top puberulous the apiculus and around it clad with a rufous tomentum, margin floccose ciliate ; young leaves revolute in bud upper surface sprinkled with caducous floccose fasciate

* *Rhododendron roseotinctum*, Balf. f. et Forrest.—Frutex nanus vix 1 m. altus. Rami breves glabrescentes nodulosi alabastrorum perulis persistentibus haud vestiti. Folia ad apicem ramulorum rosulatim 5–6 aggregata ad 5.5 cm. longa ; lamina coriacea ovalis vel oblongo-ovalis circ. 5 cm. longa 2.5 cm. lata apice rotundata mucronulata, margine paullo revoluta, basi obtusa in petiolum prolongata ; supra opaca olivacea subrugulosa glabrescens ; infra grisea indumento tenui laevi scintillante bistrato induta, costa media prominula erubescente ; petiolus circ. 5 mm. longus glabrescens. Umbella terminalis 3–4-flora ; bracteae fertiles rotundatae sericeae ad 1.5 cm. longae ; bracteolae ensiformes sparsim pilosae circ. 8 mm. longae ; pedicelli stricti ad 2.5 cm. longi glanduloso-setulosi et floccosi. Calycis ad 3 mm. longi cupula brevis institam membranaceam marginalem rubram undulatam et obscure lobulatam gerens, lobulis extus glabris ad marginem glanduloso-setulosis. Corolla aperte cupulari-campanulata plus minusve roseo-tincta ad 3.2 cm. longa, basi carnea intus septis interpetalinis incompletis divisa, glabra ; lobi rotundati reflexi. Stamina 10 inaequalia corolla breviora ; filamenta puberula. Discus glaber. Gynaeceum circ. 2.8 cm. longum corolla brevius staminibus longius ; ovarium breviter ovoideum truncatum dense glanduloso-setulosum et floccosum ; stylus glaber.

hairs. Leaves as much as 5.5 cm. long; lamina leathery oval or oblong-oval sometimes slightly oboval as much as 5 cm. long 2.5 cm. broad rounded at apex ending in a short red hydathodal mucro, margin slightly cartilaginous and slightly recurved, base obtuse and prolonged as a narrow wing upon the short petiole; upper surface olive-green mat slightly rugulose glabrescent with vestiges of juvenile hairs particularly in the groove of the midrib, primary veins some 9 on each side also grooved; under surface grey-white with prominent slightly pink-tinted more or less floccose midrib, primary veins slightly raised but clad like rest of surface with a thin smooth scintillating bistrate persistent indumentum, the hairs of the upper stratum with a short stout pluricellular stipe crowned by many broad thin-walled elongated cell-branches interlocking to form the finely honeycomb-surface and covering a number of shorter stalked or almost sessile like-constructed hairs with shorter branches, eglandular; petiole short reddening about 5 mm. long glabrescent. Flowers in a terminal 3–5-flowered umbel; flower-bud globose; outer sterile bracts like but a little larger than the scale-leaves of foliage-bud, inner fertile bracts chartaceous rotundate cucullate as much as 1.5 cm. long outside and inside silky; bracteoles ensiform about 8 mm. long nearly 1 mm. broad sparingly and shortly hairy from base upwards on margin and back, at the acuminate tip slightly crested; pedicels as much as 2.5 cm. long usually shorter about 1.5 cm. densely setulose-glandular with ovoid glands at the end of long stout setulose stalks and mixed with a few fasciate floccose hairs, expanded under the calyx. Calyx about 3 mm. long shallow saucer-shaped; base of the cup about 1 mm. long gland-setulose outside fleshy expanding at the rim into a red somewhat membranous undulate fringe glabrous outside and showing more or less distinctly 5 irregular rounded lobes setulose and glandular on the margin, this fringe apparently sometimes deciduous. Corolla cupular-campanulate open from the base creamy-white or dull rose deeply tinted rose on the lobes, about 3.2 cm. long somewhat fleshy at base and 5-gibbous, inside with 5 imperfect interpetaline septa glabrous outside and inside; lobes 5 recurving broad about 1.2 cm. long 2.2 cm. broad imbricate auricled. Stamens 10 unequal shorter than corolla, longest about 2.2 cm. long shortest about 1.6 cm. long; anther about 2.5 mm. long; filaments stout widened downwards, puberulous from the base through one-third to one-fourth the length. Disk glabrous. Gynaeceum about 2.8 cm. long shorter than corolla longer than stamens; ovary conoid truncate deeply grooved densely glandular, glands adpressed ovoid orange-coloured somewhat setulose long-stalked

mixed with a few floccose stalked hairs; style glabrous stout clavate below the lobulate lipped broad discoid stigma. Capsule cylindric about 1 cm. long about 7 mm. in diameter dark brown with vestiges of ovary indumentum dehiscing by 5 valves from apex to base.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12,000 ft. Open pasture and amongst boulders. Shrub of 2–3 ft. Flowers creamy-white, beautifully margined deep rose-crimson. G. Forrest. No. 14,211. July 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 11,000 ft. In open cane scrub. Shrub from 2–2½ ft. Flowers dull soft rose without markings. G. Forrest. No. 14,268. July 1917.

One of the most charming forms into which the type of *Rh. sanguineum*, Franch., diverges on the highlands in the N.W. of Yunnan. It seems to have shorter and broader and less obovate leaves than others of the series and its corolla forms a shallower more open bell. The bright rose-tinting of the corolla-lobes which is retained to some extent in the dried material is a marked beautiful feature according to Forrest. On p. 80 the relationships of *Rh. sanguineum* and its allies are discussed.

4018 **Rhododendron russatum,*** Balf. f. et Forrest.†

Shrub about 1 m. high with stiff thin branches. Branchlets a year old 2 mm. in diameter squarrosely and rufescently lepidote

* *russatus*, reddened—in allusion to the under-leaf indumentum.

† ***Rhòdodendron russatum,*** **Balf. f. et Forrest.—Frutex nanus ad 1 m. altus ramis strictis tenuibus. Rami annotini ad 2 mm. diam. squamis rufescentibus** squarrosi. Folia petiolata ad 3 cm. longa; lamina crasse coriacea oblongo-**elliptica vel oblongo-ovalis** ad 2.5 cm. longa 1.4 cm. lata, apice rotundata mucro-**nata, margine vix recurva**, basi cuneata vel obtusa; supra laevis atroviridis opaca squamis peltatis parvis uniformibus sessilibus fere contiguis subaurantiacis lepidota, costa media sulcata epilosa; infra laete russo-brunnea squamis magnis ruris projectis et parvis aurantiacis subjectis aequaliter commixtis stipitatis contiguis imbricatim vestita, costa media conspicua; petiolus circ. 5 mm. longus lepidotus. Flores in umbellas capituliformes 6-floras terminales dispositi; **bracteae** sub anthesi plus minusve persistentes; bracteolae filiformes circ. 7 mm. **longae** calyce longiores; pedicelli circ. 2 mm. longi puberuli et sparsim lepidoti. Calyx **cupularis** circ. 5 mm. **longus 5-partitus; cupula 0.5 mm. longa extus glabra** vel minute puberula; lobi obovato-oblongi vel oblongi obtusi erosi extus minute puberuli sparsim lepidoti vel elepidoti, intus glabri, setuloso-ciliati. Corolla subrotata intense purpureo-caerulea circ. 1.5 cm. longa extus elepidota; tubus infundibuliformis circ. 5 mm. **longus extus pubescens intus puberulus**; limbus patens 5-lobus; lobi ovales apice rotundati crenulati circ. 8 mm. longi. Stamina 10 alterna longiora et breviora, longiora corollam paullo superantia; filamenta intra corollae tubum dense lanato-villosa. Discus puberulus. Gynaeceum circ. 2 cm. longum corolla et staminibus multo longius; ovarium ovoideum circ. 2 mm. longum sulcatum pilis brevibus adscendentibus puberulum piloso-cristatum superne squamis ramentaceis plus minusve lepidotum; stylus rubro-purpureus basi pilosus.

with stalked peltate scales, the scales or their remains appearing as black warts on the dirty grey older branches. Foliage-buds small about 3 mm. long narrowly ovoid pointed surrounded by 2 or 3 dwarfed foliage-leaves, scale-leaves few about 6, outermost elongated triangular ciliate densely brown-lepidote outside, inner more membranous profusely ciliate oblong obtuse cucullate; young leaves convolute. Leaves petiolate as much as 3 cm. long; lamina thickly leathery concave downwards, oblong-elliptic or oblong-oval as much as 2.5 cm. long and 1.4 cm. broad obtuse slightly narrowed or rounded at the apex and deflexedly mucronate, margin hardly recurved, base broadly cuneate or obtuse; upper surface plane dark green opaque with a bronze tint from the indumentum of small uniform almost contiguous peltate scales, the scales sessile with broad convex umbo filled with amber-coloured secretion and an equally broad translucent fringe, midrib grooved epilose lined by the scales, some primary veins showing faintly; under surface bright russet-brown lepidote with contiguous imbricate stalked peltate scales with broad convex umbo and equally wide fringe, all scales infiltrated with red or orange secretion, the red-tinted ones larger and projecting slightly over and equally intermixed with the others as conspicuous points, midrib conspicuous; petiole lepidote like the stem as much as 5 mm. long. Flowers in about 6-flowered compact capituliform umbels at the end of the branchlets; bracts more or less persistent during flowering, outermost crustaceo-coriaceous broadly ovate shortly acuminate keeled, on the back densely rufously lepidote and puberulous, inside sericeous, ciliate, intermediate rotundate about 8 mm. long and broad, innermost fertile membranous pale yellow-brown oblong cuneate or obovate somewhat truncate at apex and slightly apiculate, elepidote on back but densely puberulous, hairs of the ciliate summit often red and greasy; bracteoles filiform brown shortly adpressedly pilose and hair-crested about 7 mm. long, longer than calyx; pedicels very short about 2 mm. long puberulous and with a few white translucent concave peltate scales. Calyx about 5 mm. long, cupular membranous 5-partite almost to the base; cup about 0.5 mm. long glabrous or finely puberulous outside sometimes with one or two peltate scales; lobes obovate-oblong or oblong obtuse erose pale yellowish-green glabrous inside, finely puberulous outside with a line of peltate scales along middle or elepidote, setulose-ciliate with sometimes a few peltate scales also on margin. Corolla about 1.5 cm. long deep purple-blue with a white throat produced by the profuse white hair-tufts on the staminal filaments, elepidote; tube funnel-shaped about 5 mm. long pubescent outside, puberulous inside, hardly fleshy, expanded upwards into a patent

broad 5-lobed limb ; disk of the limb concave narrow slightly puberulous ; lobes subequal oval rounded at apex hardly crenulate about 8 mm. long 6 mm. broad. Stamens 10 alternately long and short, longer about 1.7 cm. long exceeding corolla with red-purple anther 2 mm. long, shorter about 1.4 cm. long with anther 1.5 mm. long ; filaments slightly widened downwards, base over about 1.5 mm. naked, above that and within the tube of the corolla densely lanately and intricately villous. Disk puberulous on ridges. Gynaeceum about 2 cm. long longer than corolla and stamens ; ovary ovoid about 2 mm. long grooved puberulous with short ascending hairs and with a white hair-crest at top, in upper half more or less lepidote with ramentaceous white loose peltate scales ; style red-purple pilose in lower third but only slightly expanded under the lobulate dark-purple lipped stigma.

N.W. Yunnan. Kari Pass. Alt. 12,000 ft. Lat. 28° N. Open moist stony pasture. Shrub of 2–4 ft. Flowers deep purple-blue, throat white. G. Forrest. No. 13,915. June 1917.

Rh. russatum is a particularly bright species from the balls of deep purple-blue flowers with white throat formed freely at the ends of the branchlets and from the intense russet-colour of the under-leaf indumentum. It is a most distinct member of the series of Lapponicum, and its place in the series is easily assigned. It belongs to the sub-series in which the under-leaf indumentum consists of contiguous or nearly so bicolorous scales—dark and light usually equally intermixed. From all the purple-flowered species of the Lapponicum series excepting *Rh. dasypetalum*, Balf. f. et Forrest (see p. 48) it differs in the character of the hairy outside to the corolla. Other diagnostic marks separating it from members of its sub-series are : elepidote corolla, leaves more or less oblong narrowed to base, style hairy longer than the 10 stamens. Its nearest ally seems to be *Rh. capitatum*, Maxim. from Kansu with very much narrower shorter leaves.

A word about the resemblance to *Rh. dasypetalum* the other known purple-flowered member of the Lapponicum series with corolla hairy outside. The plants are really very different and there should never be any risk of their being confused but as they have in common this pubescent outer surface to the corolla one may for the moment—as the plants are likely to be in cultivation from Forrest's seeds—put one's self in the position of one who had before him a plant with this corolla-feature and wished to know which of the two it was. The following tabulated statement will supply distinctive marks :—

Rh. dasypetalum.	*Rh. russatum.*
Leaves small at most 1.5 cm. long and 6 mm. broad.	Leaves larger reaching 3 cm. long and 1.4 cm. broad.
Leaf under-surface buff-coloured with uniform concolorous scales.	Leaf under-surface dark russet-coloured with bicolorous scales equally mixed.
Flowers in terminal 2-flowered umbels with pedicels about 4.5 mm. long.	Flowers in 6-flowered compact umbels with pedicels about 2 mm. long.
Bracteoles much shorter than pedicels.	Bracteoles longer than pedicels and calyx.
Calyx-lobes purple puberulous inside.	Calyx-lobes green glabrous inside.
Corolla pilose over the limb and base of lobes outside.	Corolla pilose on the tube outside.
Stamens shorter than corolla.	Stamens longer than corolla.
Style barely longer than corolla.	Style much longer than corolla.

4820

Rhododendron russotinctum, Balf. f. et Forrest.*

Shrub 1–2.5 m. high with straight virgate twigs. Young branches densely glandular with long stalked red ovoid glands very sticky mixed with much-branched dendriform hairs with cylindric undulate and curled branches; branches a year old dark red about 3 mm. in diameter glabrescent the leaf-scales of the foliage-bud persisting for a year or two. Foliage-buds thin narrow sharp-pointed with few scale-leaves; outermost scale-leaves broadly ovate or rounded keeled apiculate or shortly tailed crustaceous glandular with red glands and with branched hairs outside like those of stem, margin ciliate; intermediate scales oblong-oval or oboval with a short apiculus; innermost ligulate-spathulate yellow membranous acuminate as much as 3 cm. long 5 mm. broad glandular on back and also with branched greasy hairs, margin long-ciliate; young leaves revolute, upper surface sparingly red-glandular and floccose, under surface densely so the hairs in two strata. Leaves

* *Rhododendron russotinctum*, Balf. f. et Forrest.—Frutex ad 2.5 m. altus ramis subvirgatis primo glutinosis glandulas rubras plurimas et pilos dendriformes gerentibus demum glabrescentibus. Alabastrorum perulae plus minusve persistentes. Folia ad 10.5 cm. longa; lamina anguste oblonga circ. 2.5 cm. lata breviter apiculata, basi obtusa vel paullo rotundata; supra glabrescens glandularum pilorumque vestigiis notata; subtus ferruginea indumento bistrato vestita, pilis strati superi dendriformibus multi-ramosis (ramulis cylindricis curvatis) laxe intertextis plus minusve deciduis, pilis strati inferi rosulatis breviter ramosis cum glandulis intermixtis; petiolus circ. 1.5 cm. longus glanduloso-floccosus. Flores in umbellam circ. 8-floram racemosam dispositi; pedicelli circ. 1.8 cm. longi glanduloso-floccosi. Calyx parvus glandulosus. Corolla campanulata alba roseo-suffusa et sparsim maculata circ. 3.7 cm. longa intus puberula 5-loba. Stamina 10 inaequalia; filamenta puberula. Discus puberulus. Gynaeceum circ. 3 cm. longum corolla brevius staminibus longius; ovarium dense glandulosum; stylus glaber.

petiolate as much as 10.5 cm. long; lamina thinly leathery narrowly oblong as much as 9.5 cm. long 2.5 cm. broad narrowed to a shortly apiculate tip, margin cartilaginous recurved, base obtuse or slightly rounded; upper surface olive-green mat with a grooved midrib lined by withered hairs and glands, primary veins about 12 on each side hardly visible, the surface generally glabrous but with traces of the bases of juvenile hairs and glands; under surface a uniform rusty red the midrib prominent and coloured like rest of surface and very glandular (the young leaves are a yellow-green beneath) whole surface covered with a dense bistrate indumentum of hairs, hairs of the upper stratum dendriform much-branched the stalk not stout the branches cylindric thick-walled undulate and curving interlocking and forming a loose canopy to the lower stratum of rosettes of short cylindric thin-walled hairs intermixed with a few red ovoid shortly-stalked glands, the upper stratum often deciduous, the surface of the indumentum always somewhat honeycombed, never smooth and suède-like, never shining or agglutinate; petiole as much as 1.5 cm. long grooved above stout wrinkled red often very dark red, glandular and floccose more or less. Inflorescence a small racemose-umbel of some 8 flowers with rhachis 8 mm. long glandular and floccose the hairs rufous; bracts and bracteoles unknown; pedicels about 1.8 cm. long very oblique to axis of flower glandular with stalked red ovoid glands and with a few greasy short-branched floccose hairs. Calyx small very glandular cupular about 1.5 mm. long fleshy 5–lobed; lobes deltoid about half the length of the calyx. Corolla campanulate white flushed rose with crimson spots about 3.7 cm. long somewhat fleshy posteriorly, glabrous inside and outside 5-lobed; lobes rounded emarginate somewhat crenulate about 1.2 cm. long 1.5 cm. broad. Stamens 10 unequal shorter than corolla and gynaeceum; filaments widened to base and puberulous from base to above middle in the shorter stamens. Disk puberulous. Gynaeceum about 3 cm. long a little shorter than corolla; ovary conoid truncate grooved about 5 mm. long densely glandular with long-stalked globose and ovoid glands; style glabrous at the top somewhat clavate and forming a lip to the discoid lobulate stigma.

W.N.-W.-Yunnan. Mountains N. of Atuntzu. Lat. 28° 35′ N. Alt. 13,000 ft. In open pine forest. Shrub of 6–8 ft. Flowers white flushed rose with few markings. G. Forrest. No. 13,971A. June 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 11,000–12,000 ft. Open pine forest and in cane brakes. Shrub of 6–9 ft. Flowers white

faintly flushed and margined rose with crimson markings. G. Forrest. No. 14,243. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 35′ N. Alt. 13,000–14,000 ft. In Rhododendron thickets. Shrub of 5–8 ft. G. Forrest. No. 14,913. Sept. 1917.

This species belongs to a phylum of Rhododendron in which the pedicels, calyx, and ovary are glandular. It is distinguished at a glance by the bright rusty-red bistrate indumentum, the upper stratum of which is formed of characteristic dendriform branched curled hairs which interlock in a loose wool-like canopy and seem to be often deciduous leaving exposed the under stratum of rosette short-branched hairs. The very young leaves seem to have many glands intermixed with the hairs of the under stratum. At maturity the midrib is particularly glandular. The colour is in the young leaves a yellowish green and changes gradually to the rusty colour which is best seen on leaves in their second year. The indumentum surface here is never shining and the hairs are never agglutinate.

The species is one of a group well-developed in these N.W. Yunnan regions, and finds its nearest allies in *Rh. Albertsenianum*, G. Forrest and *Rh. levistratum*, Balf. f. et Forrest.

Rhododendron schizopeplum,* Balf. f. et Forrest.†

Shrub 1–4 m. high compactly branched with short stout glabrescent branches showing up to end of first year a few grey traces of juvenile floccose hairs at first reddish then becoming grey ultimately the bark cracking and exposing a pale buff surface. Foliage-bud ovoid pointed stout outer scales red thick leathery rounded and apiculate either glabrous and somewhat shining outside or with traces of floccose hairs, margin floccose-ciliate. Leaves petiolate as much as 9 cm. long ; lamina leathery elliptic oblong-elliptic or oblong about 8 cm. long 3.5

* *σχίζειν* to split ; *πέπλος* covering—in allusion to the splitting indumentum.

† *Rhododendron schizopeplum*, Balf. f. et Forrest.—Frutex ad 4 m. altus ramis brevibus crassis primo floccosis demum glabrescentibus. Folia petiolata ad 9 cm. longa ; lamina coriacea elliptica vel oblonga circ. 3.5 cm. lata apiculata, margine recurvata, basi cordulata vel rotundata ; supra atro-viridis opaca in sulco costae mediae dense floccosa caeteroquin vestigiis pilorum juvenilium notata ; subtus primo alba nitens dein brunnescens indumento bistrato induta, strato supero agglutinato demum areolatim fisso haud detersili, costa media erubescente floccosa prominula ; petiolus brevis ad 1 cm. longus glabrescens saepe coloratus. Umbella compacta 8–10-flora ; bracteae lanato-pubescentes ; pedicelli breves circ. 1 cm. longi glabri. Calyx cupularis parvus vix lobatus. Corolla campanulata rosea maculata circ. 3 cm. longa intus puberula 5-lobata ; lobi lati breves. Stamina 10 inaequalia corolla multo breviora ; filamenta infra complanata lata villosa. Discus puberulus. Gynaeceum circ. 2 cm. longum stamina longiora aequans ; ovarium glabrum ; stylus validus glaber.

cm. broad somewhat narrowed at the summit and there somewhat acute or sub-apiculate and ending in a horny hydathodal mucro, margin recurved, base cordulate or rounded ; upper surface dark green mat shagreened (when dry) midrib grooved the groove filled with floccose withered hairs, primary veins some 12 on each side hardly grooved, rest of surface glabrescent marked more or less with vestiges of fallen floccose hairs ; under surface glossy at first white then becoming buff or brown along the midrib, later dull brown all over, midrib stout prominent tinted pink and with floccose adpressed hairs, primary veins hidden by indumentum, indumentum bistrate of long-stalked long-branched hairs in the upper stratum their branches becoming agglutinated into a smooth white shining surface canopy over the lower stratum of sessile rosette-hairs with short vesicular branches, as leaf oldens the upper indumentum splits into areolae of irregular shape which become brown and expose the under stratum in the chinks but are not detersile ; petiole about 1 cm. long rarely longer, at maturity glabrescent retaining for a time some vestiges of juvenile floccose hairs, wrinkled often dark black-purple or bright red. Inflorescence a small compact umbel of some 8–10 rosy red-spotted flowers ; flower-bud globose ; outer bracts rounded crustaceous winged densely lanate pubescent outside floccose-ciliate, inner bracts obovate-spathulate about 2 cm. long 8 mm. broad submembranous with rounded apiculate summit softly silkily pubescent all over and ciliate ; bracteoles soon falling linear about 7 mm. long densely pilose; pedicels short about 1 cm. long glabrous. Calyx minute cupular about 1.5 mm. long glabrous ; cup hardly expanded into an undulated margin. Corolla campanulate rose with deep crimson spots posteriorly about 3 cm. long glabrous outside, pubescent inside, 5-lobed ; lobes short and broad about 8 mm. long 2 cm. broad somewhat unequal the antero-lateral pair slightly the smaller, emarginate undulate. Stamens 10 unequal much shorter than corolla, longest about 2 cm. long with anther 3.5 mm. long, shortest 1.4 cm. long with anther 3 mm. long ; filament flattened and broad at base, prominently villous from base through half the length in shorter ones much less so in longer ones. Disk conspicuous puberulous. Gynaeceum short about 2 cm. long about equalling longest stamens ; ovary conoid truncate about 3.5 mm. long dark purple (when dry) glabrous ; style stout glabrous not clavate at top but flattened into a disk which forms a lip to the discoid lobulate stigma.

W.N. Yunnan. Mountains north of Atuntzu. Lat. 28° 35′ N. Alt. 14,000 ft. Open rocky situations. Shrub of 3–4 ft. Flowers deep rose with crimson markings. G. Forrest. No. 14,094. June 1917.

Yunnan. On the Li-ti-ping. Lat. 27° 12′ N. Alt. 12,000 ft. In open thickets. Shrub of 4–8 ft. Flowers faintly flushed rose exterior with deep crimson markings. G. Forrest. No. 14,053. June 1917.

Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 13,000 ft. Open situations on margins of forests. Shrub of 4–6 ft. Flowers deep rose with deep crimson markings. G. Forrest. No. 14,119. July 1917.

Another member of the series which centres in *Rh. taliense*, Franch. It has many characters by which it can be recognised. Of these an easily observed one is the indumentum on the under surface of the typically elliptic to oblong leaves with cordulate base. It is bistrate and the hairs of the upper stratum are always agglutinated forming a white shining smooth surface-canopy over the underlying hair-layer. As the leaf oldens the indumentum cracks and dries but does not fall or peel off. At the same time the indumentum becomes brown always at first on each side of the prominent pink midrib. Subsequently it may become brown all over. This feature recalls the condition of the indumentum as it has been described in *Rh. flavorufum*, Balf. f. et Forrest, where the splitting is much more marked. *Rh. flavorufum* is without question an ally of *Rh. schizopeplum* but is easily distinguished by its young yellow under-leaf indumentum which becomes dark red on older leaves and not only splits but scales off in patches.

3952 **Rhododendron sclerocladum,*** Balf. f. et Forrest.†

A shrub barely 1 m. high with hard rigid erect branches. Branchlets of the year about 1 mm. in diameter furfuraceously

* *σκληρός*, rigid—in allusion to the rigid branch-habit.

† *Rhododendron sclerocladum*, Balf. f. et Forrest.—Frutex rigidus circ. 1 m. altus. Rami erecti stricti duri, hornotini circ. 1 mm. diam. epilosi squamis peltatis breviter stipitatis furfuraceo-lepidoti, vetustiores cinerei. Alabastrorum perulae exteriores rotundatae, interiores obovatae membranaceae, extus lepidotae, ciliatae. Folia petiolata ad 1.5 cm. longa; lamina crasse coriacea oblongo-ovalis vel obovata ad 1.4 cm. longa 6 mm. lata apice rotundata vel late obtusa mucronulata mucrone decurvato, margine obscure crenulata glabra nunc basi ciliata, basi obtusa vel late cuneata; supra atroviridis opaca squamis uniformibus marcidis albidis sessilibus lepidota, costa media sulcata sulco puberulo; infra plus minusve rufescens vel fulva et rufo-punctulata squamis bicoloribus (fuscis et pallidis) contiguis subimbricatis stipitatis irregulariter distributis vestita; petiolus lepidotus circ. 1 mm. longus supra sulcatus ibique puberulus. Flores in umbellas circ. 4-floras terminales dispositi; bracteolae subclavatae ciliatae extus lepidotae pedicellis longiores; pedicelli circ. 4 mm. longi plus minusve lepidoti. Calyx cupularis circ. 6.5 mm. longus 5-partitus; cupula extus lepidota; lobi subaequales virides vel rosei oblongi obtusi intus glabri extus lepidoti lanato-ciliati. Corolla purpureo-rosea zygomorpha circ. 1.8 cm. longa extus epilosa lepidota 5-loba; tubus late infundibuliformis circ. 5 mm. longus ad os minute puberulus; lobi inaequales postici circ. 7 mm. longi 8 mm. lati antici breviores. Stamina 10 corollam subaequantia alternatim longiora et breviora; filamenta intra tubum

lepidote with shortly stalked membranous concave peltate scales, epilose, indumentum of twigs a year old dark-brown, blackening on older dark-grey branches. Scale-leaves of the foliage-buds few outer broadly cordate or rounded inner obovate membranous straw-coloured truncate at apex, inside sericeous, outside sparingly lepidote at top, ciliate ; young leaves convolute densely lepidote on both sides, puberulous on midrib towards base, ciliate ; petiole lepidote grooved puberulous in the groove. Leaves petiolate as much as 1.5 cm. long ; lamina thickly coriaceous oblong-oval or obovate as much as 1.4 cm. long 6 mm. broad rounded or obtuse at apex recurved mucronulate, margin cartilaginous recurved obscurely undulate or crenate glabrous sometimes ciliate at base, base obtuse or broadly cuneate ; upper surface dark-green usually opaque lepidote with discontiguous uniform white drying sessile scales with broad convex umbo and equally broad translucent fringe, midrib grooved groove puberulous towards base ; under surface rufescent and blotched or somewhat punctulate lepidote with contiguous imbricate stalked bicoloured intermixed and somewhat irregularly distributed peltate scales (the stalks sunk in pits), some with the broad umbo infiltrated with scintillating bright red secretion the fringe equally broad and tinted, others orange or paler tinted, midrib prominent less lepidote ; petiole lepidote like the young stem, grooved above and there puberulous about 1 mm. long. Flowers in terminal umbels of about 4 flowers ; bracts falling off at flowering, unknown ; bracteoles more persistent pale brown membranous linear-clavate ciliate lepidote on back at the clavate end, hair-crested about 7 mm. long longer than pedicels hardly as long as calyx ; pedicels about 4 mm. long dark-purple more or less lepidote with large seal-like whitish peltate scales. Calyx cupular about 6.5 mm. long 5-partite ; cup about 0.5 mm. long densely lepidote outside ; lobes subequal membranous greenish or yellowish or pink oblong obtuse truncate or rounded at apex glabrous inside, lepidote along the middle of back, margin and summit fringed more or less and lanately ciliate. Corolla purple-rose zygomorphous somewhat lipped about 1.8 cm. long epilose outside and lepidote ; tube widely funnel-shaped about 5 mm. long finely puberulous at throat expanding into a 5-lobed somewhat erect concave limb ; lobes unequal oblong-ovate lobulate with a rounded top lepidote along the midrib with many large seal-like peltate scales, posterior shortest about 7 mm. long and 8 mm. broad, antero-lateral as much as 9 mm. long. Stamens 10 about same length as corolla alter-

corollinum villosa. Discus puberulus. Gynaeceum circ. 2.1 cm. longum corolla staminibusque multo longius ; ovarium conoideo-truncatum circ. 2.5 mm. longum epilosum, lepidotum ; stylus puberulus.

nately long and short, longest about 1.7 cm. long with ovoid anther 1.5 mm. long ; filaments at slightly widened base naked over about 1.5 mm., above base villous within corolla-tube. Disk puberulous below ovary. Gynaeceum about 2.1 cm. long much longer than corolla and stamens ; ovary conoid truncate about 2.5 mm. long densely clad with imbricate yellowish or whitish peltate membranous stalked scales, epilose ; style purple-red puberulous at base not expanding below the lobulate discoid narrow lipped stigma.

E.N.W. Yunnan. Mountains of the Chungtien plateau. Open rocky pasture and on the margins of pine forests. Alt. 11,000 ft. Lat. 27° 30′ N. Shrub of 3–4 ft. Flowers purplish rose. G. Forrest. No. 12,665. July 1914.

Rh. sclerocladum is one of the Lapponicum series and belongs to that set of them in which the under-leaf indumentum is composed of contiguous bicoloured scales—dark and pale—about equally intermixed. As the leaves olden here the number of the dark-coloured scales increases and the surface may acquire a rufescent nearly uniform aspect. The intermixture of scales —dark and pale-coloured—is not so uniform as in other species of the set and the under surface of the leaf may be described as somewhat blotched. The species to which *Rh. sclerocladum* seems to be nearest is *Rh. rupicolum*, W. W. Sm., from which the colour as well as the very marked zygomorphy of the corolla at once distinguish it. It is moreover a plant of different habit—a stiff erect scrub plant with hard woody branches with a tendency to elongate its subfloral buds into vegetative shoots before flowering is over and thus to conceal the flowers.

4822 **Rhododendron serpens,** Balf. f. et Forrest.*

A woody creeping undershrub rising a few centimetres above the soil rooting freely from the stems, the stems glabrous fairly stout as much as 4 mm. in diameter when a year old clad more

* *Rhododendron serpens*, Balf. f. et Forrest.—Suffrutex humilis repens radicans. Rami glabri alabastrorum perulis extimis persistentibus plus minusve vestiti. Folia ad 5.5 cm. longa ; lamina crasse coriacea ovalis vel oblongo-ovalis ad 5 cm. longa 2.5 cm. lata saepe minor, obtusa mucronulata, margine revoluta, basi obtusa in alam angustam petiolarem prolongata ; supra olivacea opaca costa media et venis omnibus sulcatis glabrescens sed pilorum juvenilium vestigiis notata ; infra indumento tenui plus minusve detersili pilorum floccosorum brunneorum superficiem epidermalem pallide viridem tegente vestita, costa media prominula ; petiolus circ. 5 mm. longus glabrescens. Umbella terminalis 2-flora bracteis intimis paucis pallide flavis et rubro-tinctis membranaceis apicem versus sericeis sub anthesi cincta ; pedicelli inaequales ad 1.3 cm. longi glabri. Calyx parvus 5-lobus ; lobi obscure ciliati. Corolla tubuloso-campanulata rosea emaculata circ. 3 cm. longa extus intusque glabra 5-loba ; lobi rotundati emarginati. Stamina 10 subaequalia corolla gynaeceoque breviora ; filamenta puberula. Discus puberulus. Gynaeceum circ. 2.7 cm. longum corolla brevius ; ovarium cylindrico-conoideum pilis fasciatis tomentosum, eglandulosum ; stylus glaber.

or less with the persistent outer scale-leaves of the foliage-buds showing very short annual growths producing about 5 foliage leaves at the top. Outer scale-leaves of foliage-bud ovate acute or shortly acuminate keeled somewhat crustaceous puberulous outside, sericeous at the top inside, margin fringed with branched brownish hairs more numerous at the tip; inner scale-leaves yellowish more membranous ligulate-spathulate with adpressed hairs inside and outside, hair-fringed. Leaves petiolate as much as 5.5 cm. long often less; lamina thickly leathery oval or oblong-oval as much as 5 cm. long 2.5 cm. broad often less, obtuse and ending in a prominent tuberculate dark red mucro, margin cartilaginous slightly revolute, base obtuse and prolonged downwards as a narrow wing on each side of the petiole; upper surface olive-green mat, the midrib primary veins (some 10 on each side) and ultimate venation grooved making a finely areolate or somewhat shagreened surface, which is apparently glabrous but marked by vestiges of fallen glands and branched brownish hairs the groove of the midrib lined with hairs particularly at the base; beneath with a paler green epidermal surface veiled by a thin layer of floccose much-branched hairs most abundant on the veins but not confined to them, many small red glands accompany the hairs, midrib prominently raised and floccose and glandular, the veins and ultimate venation reddened and conspicuous but not raised, the indumentum sometimes falling off; petiole about 5 mm. long grooved above glabrescent but with some floccose brown hairs or their vestiges. Flowers in a 2-flowered terminal umbel; outer bracts unknown; inner bracts persistent during flowering, yellowish tinted red forming a group around the pedicels, largest about 2 cm. long nearly 1 cm. broad broadly spathulate rounded at top and slightly mucronulate, at the top inside and outside (more sparingly) sericeous with white hairs, ciliate; bracteoles unknown; pedicels unequal as much as 1.3 cm. long strict erect glabrous. Calyx small fleshy saucer-shaped about 1.5 mm. long with 5 rounded lobes often yellow quite glabrous outside faintly ciliate. Corolla tubular campanulate about 3 cm. long deep rose-coloured unspotted slightly 5-gibbous, glabrous inside and outside, 5-lobed; lobes rounded emarginate 1 cm. long 1.5 cm. broad. Stamens 10 subequal 5 slightly longer than 5 others, shorter than corolla and gynaeceum, longest about 2.3 cm. long with anther 2.5 mm. long; filaments widened to the base and from there finely puberulous to a short distance above ovary. Disk puberulous. Gynaeceum about 2.7 cm. long shorter than corolla longer than stamens; ovary cylindrico-conoid clad with stout fasciate ascending floccose hairs forming a dense or loose tomentum eglandular, the hairs white or tinted pink; style glabrou

expanding slightly to form a lip below the discoid lobulate stigma.

S.E. Tibet. Tsarong. On the northern slopes of Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 40′ N. Alt. 14,000 ft. Open rocky pasture. Prostrate shrub of 2–6 inches. Flowers pale rose without markings. G. Forrest. No. 16,698. July 1918.

S.E. Tibet. Tsarong. On Doker-la, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 14,000–15,000 ft. Open moist alpine meadows. Creeping shrub of 2–3 inches. Flowers deep rose without markings. G. Forrest. No. 16,700. July 1918.

Another beautiful species of the Forrestii series and allied to *Rh. crastum*, Balf. f. et Forrest, but easily distinguished by its glabrous young stems, much larger leaves with thin hair tomentum all over the under-leaf, glabrous pedicels, larger corolla glabrous inside without imperfect septa, eglandular ovary. See p. 60.

4823 **Rhododendron setiferum,** Balf. f. et Forrest.*

A shrub 3 m. high with straight spreading branches as much as 3 mm. in diameter when a year old, dark red-purple clad more or less densely with glandular setae mixed with shorter glands and some floccose hairs; older branches warted with blackened vestiges of setae. Outermost scale-leaves of the foliage-bud thick tailed from a rounded keeled base the tail recurving, densely glandular and with some setae outside persisting often for over a year; innermost scale-leaves membranous ligulate-spathulate acute or acuminate about 2.5 cm. long 4 mm. broad more or less puberulous outside and inside, ciliate; young leaves in the bud revolute glandular and floccose on both surfaces. Leaves petiolate as much as 9 cm. long; lamina leathery oblong about 7.5 cm. long 2.5 cm. broad slightly narrowed at the somewhat beaked apex ending in a spicular red-tipped hydathode about 1 mm. long, margin carti-

* *Rhododendron setiferum*, Balf. f. et Forrest. –Frutex ad 3 m. altus ramulis glanduloso-setulosis; alabastrorum perulae exteriores caudatae, interiores membranaceae oblongo-spathulatae. Folia petiolata ad 9 cm. longa; lamina coriacea oblonga circ. 7.5 cm. longa 2.5 cm. lata apiculata, margine paullo recurva, basi truncatula vel subrotundata; supra olivacea glabrescens floccorum et glandularum juvenilium vestigiis vestita; subtus fulva indumento tenui persistente e strato supero floccoso et infero glanduloso aedificato induta et costa media venisque primariis rubris notata; petiolus ad 1.5 cm. longus glanduloso-setulosus ruber. Flores in umbellam ad 10-floram dispositi; bracteae dense sericeae; bracteolae minutae lineares ad 7 mm. longae; pedicelli glandulosi. Calyx ruber conspicuus 5-lobus ad 1 cm. longus; cupula lata circ. 3 mm. longa glandulosa; lobi inaequales ligulati membranacei apice rotundati extus glandulosi. Corolla infundibuliformis intus kermesino-variculata puberula, extus glabra; lobi rotundati lati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta puberula. Discus puberulus. Gynaeceum corolla paullo brevius; ovarium conoideum truncatum dense glanduloso-setulosum; stylus basi puberulus.

laginous reflexed obscurely undulate, base trunculate or rounded ; upper surface olive-brown glabrescent somewhat shagreened (when dry), but with withered remains of juvenile floccose hairs particularly in groove of midrib, primary veins hardly visible about 14 on each side ; under surface dark buff-coloured with a reddened especially at base much elevated midrib and bright red primary veins hardly raised, the whole covered with a very thin indumentum of loose much-branched flock-like greasy rufous-brown hairs the branches interwoven, intermixed with red clavate short-stalked glands, the midrib less floccose ; petiole dark red grooved gland-setulose and floccose as much as 1.5 cm. long. Inflorescence an umbel of about 10 flowers the axis densely floccose ; the outermost small crustaceous rounded bracts followed by several tailed ones with glandular outer surface, the inner ones obovate or ovate or oblong cucullate rounded at apex and apiculate about 1.5 cm. long densely sericeous outside and inside more or less persistent during flowering ; bracteoles very small about 7 mm. long filiform pilose throughout eglandular ; pedicels as much as 2 cm. long glandular with stalked red ovoid glands and with a few floccose hairs. Calyx somewhat foliaceous red about 1 cm. long ; basal cup 3 mm. long with 5 unequal membranous ligulate lobes rounded at top, the two postero-lateral about 7 mm. long and 3 mm. broad double the length of the others, glandular outside, floccose-ciliate and glandular-ciliate. Corolla funnel-shaped creamy-white crimson-lined at base inside about 3.5 cm. long, glabrous outside, puberulous inside 5-lobed ; lobes rounded about 1.8 cm. long 2.2 cm. broad. Stamens 10 unequal shorter than corolla and gynaeceum, longest about 3 cm. long with oblong anther about 3 mm. long, shortest about 1.8 cm. long with anther 2.5 mm. long ; filaments slightly broadened to base and from the base puberulous, in shortest stamens to beyond middle in longest to a shorter distance. Disk puberulous. Gynaeceum about 3.2 cm. long slightly shorter than corolla ; ovary about 3 mm. long, conoid truncate grooved densely setulose-glandular ; style puberulous at base slightly expanded and forming a lip below the discoid lobulate stigma.

W.N.W. Yunnan. Mekong-Salween divide. Lat. 28° 20′ N. Alt. 12,000–13,000 ft. In open thickets and pine forests. Shrub of 5–9 ft. Flowers creamy white, lined crimson at base. G. Forrest. No. 14,066. June 1917.

A species which seems to have more characters connecting it with the Selense series than with other series. Its chief difference from that series is the under-leaf indumentum which with its long branched rufous floccose hairs forms a distinct layer over the underlying glands and then it has a large distinct

membranous calyx and a style puberulous at the base. The calyx-character takes it more to the Souliei section as does the leaf-form but then in the Souliei series there is a glandular style.

4011 **Rhododendron stictophyllum,*** Balf. f.†

A dwarf small-leaved shrub with very many thin short curved branches intricately intermingled. Branches a year old about 1 mm. in diameter epilose completely enclosed by a lepidote indumentum, the scales large closely pressed against one another to form a rough pitted surface each with a broad umbo and equally broad fringe, some of them dark red with infiltration by dark red secretion, others pale green with at most a yellow annulus, all blackening on the branches as these olden giving them a warted surface. Foliage-buds ovoid minute covered by few scale-leaves; outermost scale-leaves crustaceous linear obtuse about 2 mm. long epilose rufously lepidote; intermediate broadly ovate with thinner white ciliate margin rufous-lepidote outside silky towards the top inside; innermost pair convolute membranaceous cucullate straw-coloured about 3 mm. long oblong or broadly ovate sparingly lepidote outside ciliate. Leaves petiolate as much as 1 cm. long; lamina thickly leathery oblong-oval about 8 mm. long 3 mm. broad slightly

* *στικτός*, spotted—in allusion to the under leaf-surface.

† *Rhododendron stictophyllum*, Balf. f.—Frutex nanus intricato-ramosus ramulis supremis multoties repetito-divisis. Ramuli annotini circ. 1 mm. diam. squamis peltatis rufis et pallide viridibus contiguis congestis squarrosi, seniores sordide grisei squamis verruculosi tandem decorticantes. Alabastra parva ovoidea perulis paucis obtecta. Folia petiolata ad 1 cm. longa; lamina crasse coriacea oblongo-ovalis ad 8 mm. longa 3 mm. lata apicem versus subattenuata obtusa vel subrotundata nunc utrinque attenuata et sublanceolata obscure mucronulata, margine recurvata, basi obtusa; supra atroviridis foveolata squamis peltatis arescentibus contiguis dense obtecta, costa media basi vix sulcata; subtus tulvida (costa media paullo prominula) squamis peltatis bicoloratis (fuscis et pallidioribus) fere aequaliter intermixtis contiguis nunc hic et illic paullo discontiguis vestita; petiolus circ. 2 mm. longus similiter ac caulis lepidotus. Flores 1–2 ad apicem ramulorum fere sessiles; bracteae paucae sub anthesi plus minusve persistentes, exteriores crustaceae late rotundatae apiculatae pallide brunneae extus rufo-lepidotae et puberulae ciliatae intus sericeae, intimae membranaceae spadiceae oblongae circ. 5 mm. longae 4 mm. latae cucullatae truncatae et emarginatae vertice lanato-ciliatae extus lepidotae et puberulae. Calyx minutus carnosulus vix 0.5 mm. longus cupularis dense rufo-lepidotus epilosus: lobi 5 minutissimi dentiformes vel rotundati. Corolla violacea? circ. 8 mm. longa extus sparsim lepidota epilosa; tubus campanulatus circ. 2 mm. longus fauce puberulo in limbum patentem 5-lobatum ampliatus; lobi rotundati undulati circ. 5 mm. longi 4 mm. lati. Stamina 10 corolla breviora inaequalia alternatim longiora et breviora; filamenta intra tubum corollinum puberula. Discus puberulus. Gynaeceum circ. 1 cm. longum corolla longius; ovarium circ. 2 mm. longum cylindrico-conoideum truncatum sulcatum dense flavescenti-lepidotum; stylus purpureus glaber. Capsula pallide brunnea extus lepidota oblonga circ. 4 mm. longa 1.75 mm. lata.

narrowed towards the obtuse or somewhat rounded apex occasionally narrowed to both ends and somewhat lanceolate obscurely mucronulate, margin recurved obscurely notched, base obtuse; upper surface dark green usually opaque in dry state as if contiguously pitted each pit occupied by a more or less dried-up peltate scale, the scales adpressed with a broad umbo uncoloured or infiltrated with orange-coloured secretion and then scintillating and an equally broad translucent whitish fringe, midrib invisible or slightly grooved at the base; under surface tawny clothed with an indumentum of contiguous or here and there slightly discontiguous bicolorous scales equally mixed, some scintillating with the umbo and fringe rufous projecting above the others which have a yellow annulus and uncoloured fringe, midrib slightly elevated; petiole about 2 mm. long lepidote like the young stem. Flowers 1–2 almost sessile at end of twigs; bracts few more or less persistent at flowering, outer crustaceous broadly rounded membranously winged apiculate pale brown rufously lepidote outside, puberulous on the wing, ciliate, silky within, innermost membranaceous chestnut-brown oblong about 5 mm. long 4 mm. broad hooded truncate and emarginate lanately ciliate, at top lepidote and puberulous outside, silky inside towards top; pedicel hardly half a millimetre long densely lepidote. Calyx minute fleshy barely 0.5 mm. long cupular epilose densely rufously lepidote; lobes 5 most minute as dentiform or rounded most densely lepidote projections on margin of the cup. Corolla violet-coloured subrotate about 8 mm. long outside epilose sparingly lepidote; tube campanulate about 2 mm. long, the throat puberulous spreading into an open 5-lobed limb; lobes rounded undulate about 5 mm. long 4 mm. broad. Stamens 10 unequal alternately long and short shorter than corolla, longer about 6 mm. long with purple anther about 1 mm. long; filaments slightly widened downwards, naked base about 1 mm. long, above and within the corolla-tube puberulous. Disk puberulous below the ovary. Gynaeceum about 1 cm. long longer than corolla and stamens; ovary about 2 mm. long cylindrico-conoid truncate grooved densely lepidote with yellowing scales; style purple glabrous expanded under the discoid lobulate stigma. Capsule pale brown lepidote oblong 4 mm. long 1.75 mm. in diameter dehiscing from apex to base by 5 valves.

W. Szechwan. Principality of Batang. Yaragong. High mountains. Soulié, No. 3303. June 1903. In Herb. Paris.

Another new species of the Lapponicum series from the high mountain regions in the west of Szechwan bordering on Tibet Yaragong is in lat. 29° 30′ long. 99° 20′. It is one of the set of species in which the under-leaf indumentum shows con-

spicuously a nearly equal distribution of dark scintillating rufous contiguous scales and paler-coloured ones, the former projecting beyond and more or less overarching the latter where they touch and thus giving a bistrate character to the whole covering. Other distinguishing marks of the species are: most minute fleshy epilose lepidote calyx, violet-coloured corolla lepidote outside with campanulate tube puberulous inside, stamens shorter than corolla puberulous near base, disk puberulous, ovary epilose, style glabrous longer than corolla.

Its lepidote corolla distinguishes it at once from most of the species with purple-tinted flowers in the set. *Rh. achroanthum*, Balf. f. et W. W. Sm. and *Rh. rupicolum*, W. W. Sm. alone have the character and they are very different species. *Rh. capitatum*, Maxim. and *Rh. violaceum*, Rehd. et Wils. are the only other West Chinese species with purple-tinted flowers of the set and the former is distinguished by its virgate habit, flower trusses, pilose calyx and style; the latter by its habit never producing the intricate ultimate branchlets of *Rh. stictophyllum*, ciliate calyx, funnel-shaped corolla with longer tube villous at the throat, longer corolla-lobes and other minor marks.

Of the set of species in the Lapponicum series which have the under-leaf indumentum punctulate with dark rufous scales few in number compared with the paler scales no one can be mistaken for *Rh. stictophyllum*. The forms of this set which have lepidote corolla all have a sparsely punctulate under-leaf indumentum and their habit except in the case of *Rh. telmateium*, Balf. f. et W. W. Sm. is different. In addition to the distinguishing character of absence of scales from the outside of the corolla the other species of this set may be separated from *Rh. stictophyllum* thus:—

Rh. alpicolum, Rehd. et Wils. has a hairy style shorter than the stamens; in the var. *strictum*, Rehd. et Wils. the style is glabrous but it is still shorter than the stamens.

Rh. thymifolium, Max. has the style also shorter than the stamens and has a virgate habit, and a very different under-leaf indumentum—grey and shining.

Rh. nigropunctatum, Bur. et Franch. is described as a plant of a few inches high densely branched from the base with virgate branches above, the ovate-lanceolate leaves very shortly stalked, flowers solitary, calyx campanulate with lanceolate deltoid subacute lobes, corolla shortly tubular. It was obtained in 1890 by Bonvalot and Prince Henri d'Orleans somewhere between Lhasa and Batang. I have not seen it but I cannot bring the species described here as *Rh. stictophyllum* within the description given by Bureau and Franchet of their species. The presence of peltate scales on the margin of the calyx-lobes in

Rh. nigropunctatum to which Franchet (in 1891) drew particular attention as a unique character is now known in several other species discovered since.

4824

Rhododendron syncollum,* Balf. f. et Forrest.†

A shrub as much as 3 m. high with medium-thick straight branchlets. Young branches densely floccose and glandular; branches a year old about 3.5 mm. in diameter red glabrescent but with vestiges of the early flocks and glands; older branches quite glabrous glossy. Foliage-buds elongated fusiform pointed; outer scale-leaves crustaceous reddened outside rounded about 9 mm. long keeled shortly apiculate at the rounded summit, more or less tomentose-floccose outside, inside silky at the top, margin floccose-ciliate densely tomentose around the apiculus; inner scale-leaves membranous yellow with darker middle line ligulate-spathulate about 3 cm. long 8 mm. broad obtuse or rounded with an apiculus, outer surface crumbling, inside with simple hairs towards the top, margin floccose-ciliate; young foliage-leaves in bud revolute on both sides densely floccose and glandular with globose or ovoid red or orange shortly-stalked glands, petiole clad like the lamina. Leaves petiolate as much as 10 cm. long; lamina leathery lanceolate or oblong-lanceolate as much as 9 cm. long 3.5 cm. broad somewhat beaked at apex with a prominent hydathodal mucro, margin cartilaginous plane or slightly recurved, base obtuse; upper surface dark green somewhat opaque shagreened not rugulose glabrescent but with traces of juvenile glands and hairs, midrib grooved

* σύν; κόλλα, glued together—in allusion to the agglutinate indumentum.

† *Rhododendron syncollum*, Balf. f. et Forrest.—Frutex ad 3 m. altus. Rami juveniles dense floccosi et glandulosi, vetustiores glabrescentes rubidi subnitentes. Alabastrorum perulae extimae rotundatae apiculatae extus rubescentes et plus minusve floccosi ciliati, intimae ligulatae-spathulatae flavidae; folia juvenilia utrinque cum petiolo dense glandulosa et floccosa. Folia petiolata ad 10 cm. longa; lamina coriacea lanceolata vel oblongo-lanceolata ad 9 cm. longa 3.5 cm. lata subrostrata, margine plana, basi obtusa; supra atrovirdis opaca haud rugulosa glabrescens vestigiis glandularum pilorumque notata; subtus rufo-cinnamomea laevis nitens nunc in juventute pallide fulvida, indumenti bistrati pellicula subcrustacea e pilis brevibus rosulatis stratum inferum construentibus et pilis longis stipitatis et longe ramosis agglutinatis stratum superum hic et illic secretionis naevis crustaceis atrorubris notatum aedificantibus ubique obtecta; indumentum totum mycelio plus minusve penetratum; petiolus ad 1 cm. longus glabrescens. Flores in racemo-umbellam terminalem circ. 15-floram aggregati, rhachi circ. 1 cm. longa; bracteae intimae sericeae; bracteolae ad 7 mm. longae filiformes pilosae; pedicelli ad 2 cm. longi floccosi sparsim glandulosi. Calyx minutus glandulosus et floccosus lobis 5 inconspicuis. Corolla ad 4 cm. longa campanulata plus minusve roseo-limbata maculis parvis notata; tubus intus dense puberulus; lobi lati ad 1 cm. longi 2.3 cm. lati paullo undulati et crenulati. Stamina 10 inaequalia corolla staminibusque breviora; filamenta villosa. Discus glaber. Gynaeceum circ. 2.6 cm. longum corolla brevius; ovarium circ. 3.5 mm. longum cylindrico-conoideum truncatum glabrum; stylus glaber.

lined with black-red vestiges of glands and a few hairs, primary veins some 12 on each side very inconspicuous ; under surface red-cinnamon-brown sometimes when young pale grey-buff-coloured smooth shining with black-red or paler red patches here and there specially well seen on the paler-surfaced leaves, covered by a complete thin persistent somewhat crustaceous pellicle of bistrate indumentum composed of hairs with long thick stalks and long vesicular branches spreading horizontally and agglutinate as an upper stratum and rosette-hairs on short stalks with short vesicular branches as an under stratum, many of them are reddened by a secretion which exudes and forms crusty black-red blotches large and small over the surface embedding the hairs, sometimes there is an indication of splitting of the pellicle, midrib prominent clad like the rest of the surface, rest of venation concealed by the indumentum, the whole indumentum penetrated by the mycelium of fungus ; petiole about 1 cm. long stout glabrescent like the stems. Flowers in a terminal racemose umbel about 15-flowered with a short rhachis about 1 cm. long floccose and glandular ; flower-bud globose ; outer sterile bracts like the outer scale-leaves of vegetative bud but with tails ; inner bracts persistent during flowering soft obovate spathulate rounded at top and shortly mucronulate densely silky with white hairs on both sides, towards top outside glabrous, about 2 cm. long 8 mm. broad ; bracteoles shorter than pedicels about 7 mm. long thin filiform pilose from base and white hair-crested ; pedicels about 2 cm. long floccose and sparingly glandular. Calyx minute a fleshy cup with 5 indistinct semi-lunate or slightly pointed lobes more or less glandular and floccose. Corolla campanulate washed rose deepest on margins with small crimson spots posteriorly, about 4 cm. long ; tube wide somewhat fleshy at base and there faintly 5-gibbose the gibbosities darker coloured, glabrous outside, densely puberulous inside ; limb open spreading 5-lobed ; lobes broad about 1 cm. long 2.3 cm. broad slightly undulate and crenulate. Stamens 10 unequal much shorter than corolla and gynaeceum, longest about 2.3 cm. long with anther 3 mm. long, shortest about 1.5 cm. long with anther 2 mm. long ; filaments widened to base, from base upwards through one-half or more of length densely villous. Disk glabrous. Gynaeceum about 2.6 cm. long shorter than corolla ; ovary about 3.5 mm. long cylindric-conoid truncate grooved glabrous with surface finely papillate ; style stout glabrous clavate below the lobulate discoid stigma.

W.N.-W.-Yunnan. Mountains north of Atuntzu. Lat. 28° 35′ N. Alt. 13,000 ft. In open forest. Shrub of 10 ft. Flowers washed rose deepest on margins with crimson markings. G. Forrest. No. 14,035. June 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 28° 10′ N. Alt. 11,000 ft. Open rhododendron forest. Shrub of 6–10 ft. Flowers flushed pale rose with crimson markings. G. Forrest. No. 14,105. July 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 35′ N. Alt. 13,000 ft. In open thickets and cane brakes. Shrub of 4–5 ft. Foliage only. G. Forrest. No. 14,939. Sept. 1917.

W.N.-W.-Yunnan. Mekong-Salween divide. Lat. 27° 40′ N. Alt. 13,000 ft. In rhododendron forest. Shrub of 6–10 ft. Foliage only. G. Forrest. No. 14,959. Sept. 1917.

On the Mekong-Salween divide this species represents *Rh. phaeochrysum*, Balf. f. et W. W. Sm. of the more eastern region of the Yangtze and the Chungtien Plateau in E.N.-W.-Yunnan. *Rh. syncollum* is easily diagnosed from its ally by its smaller leaves red-cinnamon-brown below, the more agglutinate and more shiny appearance of the under-leaf indumentum, by the shorter foliage-buds and the rounded not ovate outer scale-leaves and the smaller number of the inner scale-leaves, by the young leaves densely glandular above and below, the glandular pedicels and calyx. The two species show an interesting contrast in the way the young leaves of the foliage-bud are protected. *Rh. phaeochrysum* has the young leaves characteristically revolute in bud and they have a small number of floccose hairs over both surfaces. Enveloping them are the inner scale-leaves of the bud several in number each of the innermost ones forming a hood of its upper half or third and so investing the young leaves at the danger point of their tip, the lower part of the scale-leaf being narrow almost petiole-like and occupying therefore less space within the basal part of the leaf-bud where the outer thick scale-leaves give an adequate protection. In *Rh. syncollum* the revolute leaves have each of them a dense glandular covering both above and below, the glands being mixed with floccose hairs. Having this protection a smaller number of the inner scale-leaves suffices as an outside covering and these do not form so hooded an investment around the leaf-tips. In this case the protection rests mainly on gland-secretion, in *Rh. phaeochrysum* upon layers of leaf-scales. An interesting chapter might be written of such contrasts in other species of Rhododendron—and indeed in species of other genera also—as they occur in the mountainous region of N.W. Yunnan and adjacent Burma and Tibet for the edaphic and epedaphic conditions are varied and change rapidly within a limited area stamping their impress upon the vegetation in the development within phyla of forms which diverge often only slightly yet sufficiently to claim specific rank.

The under-leaf indumentum here as in so many species possessing such a covering formed of hairs is penetrated in all directions by the mycelium of a fungus. In species which have the hairs of the indumentum agglutinated for instance *Rh. Clementinae*, G. Forrest, *Rh. agganniphum*, Balf. f. et Ward, the fungus-threads are so many they conceal the form of the hairs through which they spread. In members of the Sanguineum series the fungus-threads are dark brown in colour and become so numerous as to change the colour of the indumentum layer from a bright grey to almost black. The mycelium may be traced passing into the interior of the cells of the leaf without deforming them in cases which I have examined and the whole manner of occurrence of it raises the question for what purpose is it there? Is this a case of ordinary parasitism of fungus upon host or is there commensalism? Of all families of Dicotylous plants the Ericaceae is one of the most commensal. Not only is there the endotrophic relation of fungus in the root but as has been so happily shown by Miss Rayner * the fungus may penetrate the whole body of the plant and entering the seed so ensure its presence as an adjuvant to the young plantlet from the outset of its extra-seminal life. The elements of construction in the leaves of so many of these rhododendrons suggest that an investigation from the standpoint of a possible commensalism may give interesting results. What the fungus is I do not know. The form of the mycelium is different in the leaves of different species of Rhododendron. There are fungi on the leaves and elsewhere in rhododendrons which are clearly simple parasites deforming the tissues and producing conidia and spore-fructifications on the surface of the organ attacked, and they seem different from those to which I refer as traversing by their mycelium the indumentum, wefting together its hairs, and sometimes through the abundance of their threads making difficult the recognition of the exact hair-form of the indumentum. If the mycelium is not present on all leaves, as seems to be the case, that is no valid objection to the idea of commensalism where it is present. We know that mycorhiza may develop in any plant if the conditions call for it, we know also that in individual plants some roots may become mycorhiza others adjacent showing no relation to the fungus, and therefore should there be here a *mycophyllon* its occurrence may be as sporadic as is that of mycorhiza.

* Miss Rayner in Annals of Botany, xxix (1915).

4825

Rhododendron temenium,* Balf. f. et Forrest.†

Small shrub about 1 m. high with stiff erect branches bearing terminal rosettes of 5–7 leaves which persist for two years their position on older branches marked by nodulose swellings at intervals along the branch, the swellings being formed by the clustered nodes of the foliage-leaves at the end of the branches. Branches of the year about 2 mm. in diameter dark purple-red densely clad with reddish brown bristle-like hairs covering a lower stratum of fewer scattered short-branched whitish or reddish floccose hairs, branches a year old about 3 mm. in diameter greyish with blackened vestiges of the juvenile bristles and flocks, older branches soon decorticating. Outer scale-leaves of foliage-bud hard crustaceous rounded or elliptic or oblong-elliptic as much as 6 mm. long truncate apiculate falling as bud opens, inner ones ligulate-spathulate membranous blunt carried up on elongating shoot but soon falling leaving shoot leafless below the end-rosette, all floccosely puberulous outside, sericeous inside towards apex, margin ciliate with twisted branched floccose hairs ; foliage-leaves in bud revolute floccosely pubescent on both surfaces more densely on under surface. Leaves petiolate as much as 6.5 cm. long clustered in a pseudo-whorl at the end of each year's growth ; lamina thinly leathery oblong or oblong-oval sometimes narrowly oboval 6 cm. long 2 cm. broad, often less 3 cm. by 1 cm., rounded at apex and conspicuously mucronulate, margin cartilaginous floccosely ciliate at first then eciliate and slightly notched, base obtuse or slightly rounded ; upper surface dark green glabrous but for the floccose vestiges in the grooved midrib, primary veins about 8 on each side ascending sharply from midrib hardly visible ; under surface paler tawny (in dried specimens) with very prominent red-tinted midrib and slightly raised similarly tinted

* τεμένιος, belonging to a sacred place. Doker-la in the Tsarong is one of the most renowned of the sacred mountains in Eastern Tibet.

† *Rhododendron temenium*, Balf. f. et Forrest.—Suffrutex circ. 1 m. altus ramis strictis folia 5–7 rosulata gerentibus ; ramuli juveniles setulosi et floccosi, adulti nigricantes indumenti vestigiis praediti et ad segmenti apicem cujusque anni tuberculatim incrassati. Folia parva 3–6.5 cm. longa (petiolo circ. 5 mm. longo incluso) 1–2 cm. lata, oblonga vel ovali-oblonga nunc obovali-oblonga apice rotundata mucronulata, margine primo ciliata, basi obtusa vel subrotundata, supra atro-viridia glaberrima, subtus pallidiora papillata costa media et venis primariis prominulis plus minusve pilis floccosis detersilibus vestitis. Flores in umbellam 4-floram terminalem aggregati ; pedicelli stricti setulosi et floccosi. Calyx ad 1 cm. longus late cupuliformis ad medium 5-lobatus ; lobi irregulares subcarnosuli rotundati vel ovati vel oblongi extus intusque glabri margine ciliati. Corolla kermesina emaculata tubuloso-campanulata circ. 3 cm. longa glabra ad trientem 5-lobata ; lobi rotundati. Stamina 10 inaequalia corolla breviora ; filamenta glabra. Gynaeceum corolla paullo longius ; ovarium floccis rufis glandulisque intermixtis dense vestitum ; stylus glaber in discum latum sub stigmate 5-lobulato expansus.

primary veins, ultimate venation a close network, midrib and veins showing more or less detersile floccose hairs sometimes glabrous, rest of surface papillate; petiole about 5 mm. long setulose and floccose more or less. Flowers in solitary terminal 4-flowered umbels; bracts and bracteoles not seen; pedicels about 1.5 cm. long stiff erect reddish-brown clad with fasciate seta-like red-brown hairs with a lower stratum of short branched floccose hairs, anthopode large. Calyx cup-shaped red about 1 cm. long glabrous outside and inside, slightly fleshy; cup somewhat open about 5 mm. long; lobes subequal irregular in shape broadly deltoid or subelliptic or oblong or ovate or rounded about 5 mm. long ciliate with short fasciate hairs, often reflexing as flower withers. Corolla deep crimson without blotch or spots about 3 cm. long tubular-campanulate fleshy glabrous outside and inside not gibbous at base 5-lobed; lobes rounded about 1 cm. long a little broader. Stamens 10 unequal shorter than corolla, longest about 2.5 cm. long with anther 1.75 mm. long, shortest about 1.5 cm. long with anther 1.25 mm. long; filaments slightly widened to base glabrous; anthers brown. Disk red lobulate glabrous. Gynaeceum about 3.3 cm. long longer than corolla; ovary about 5.5 mm. long ovoid truncate grooved densely tomentose with red-brown floccose hairs mixed with some stalked red clavate glands; style glabrous stout expanding at top to form a broad disk-plate within the margin of which stand erect 5 dark-coloured lobes of the stigma.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 14,000 ft. On open moorland. Shrub of 2–3 ft. Flowers deep crimson. G. Forrest. No. 14,364. July 1917. Open moorland and on cliffs. Alt. 14,000–14,500 ft. G. Forrest. No. 14,365. July 1917.

A distinct species recalling in its habit plants like *Rh. brachyanthum* and it has also the same kind of calyx. But its corolla, stamens and gynaeceum are altogether different, taking one to the vicinity of *Rh. neriiflorum* and I think that is probably the phylum to which it belongs. The falling tomentum retaining its last hold on the veins and midrib recalls forms like *Rh. maculiferum* and *Rh. detersile*. A noteworthy feature of its branches is their expansion at the end of each year's growth so that when the leaves fall there remain a series of ovoid nodular swellings like distant beads upon a rosary chain. On the cylindric parts of the stems between the nodular swellings the scars of the fallen innermost scale-leaves alone are seen. The same construction is found in *Rh. Martinianum*, Balf. f. et Forrest, a Mekong-Salween species of the Souliei series.

The flower material for examination is not good and some modification of the description may be required when better flowers are known. The plant is apparently most floriferous. It should be hardy coming from 14,000 ft. in the Tsarong, and Forrest's description of the flowers as crimson raises expectations of a species of horticultural value.

Rhododendron thyodocum,* Balf. f. et Cooper.†

A dwarf shrub about 1 m. high loosely branched sometimes virgate. Branches of the year about 1 mm. in diameter lepidote with brown scales, older ones grey more or less warted by the old scales. Scale-leaves of the small oblong foliage-buds brown-lepidote; young leaves convolute. Leaves distinctly petiolate as much as 4.5 cm. long; lamina leathery oblong or elliptic-oblong as much as 3.5 cm. long 2 cm. broad, apex rounded mucronulate, margin somewhat cartilaginous slightly recurved; obtuse at base; upper surface opaque very dark green when young covered by contiguous superficial peltate scales composed of a broad umbo infiltrated with yellow secretion and a white broad fringe, at maturity desquamated or coated with the dry dirty-grey vestiges of the scales, midrib grooved, the primary veins concealed; under surface traversed by a raised midrib and lepidote with a compact smooth indumentum of contiguous biform peltate scales, when young the surface is yellowish green most of the scales being short pale green with a concolorous

* *θυοδόχος*, odorous—in allusion to the odour of the leaves.

† *Rhododendron thyodocum*, Balf. f. et Cooper.—Frutex ad 1 m. altus laxe ramosus nonnunquam virgatus. Ramuli hornotini circ. 1 mm. lati brunneo-lepidoti. Alabastrorum oblongorum parvorum perulae paucae punctulatim brunneo-lepidotae; folia juvenilia convoluta. Folia petiolata ad 4.5 cm. longa; lamina coriacea ad 3.5 cm. longa ad 2 cm. lata oblonga vel elliptico-oblonga apice rotundata mucronulata, margine subcartilaginea leviter recurvata, basi obtusa; supra opaca fere atro-viridis primum contigue lepidota demum desquamata vel squamarum vestigiis siccis paucis sordide griseis notata, costa media sulcata; subtus costa media elevata percursa, squamis contiguis biformibus indumentum compactum laeve facientibus dense lepidota, in juventute flavido-viridis squamis plurimis aliis brevioribus pallide viridibus aliis paucis brunneis longioribus induta, in maturitate cinnamomea vel subrufescens squamis omnibus concoloribus et umbonatim rubro-resinosis; petiolus ad 1 cm. longus lepidotus. Flores pedicellati in racemum brevem terminalem ad 8-floram dispositi; pedicelli tenues 1.2 cm. longi (sub fructu aucti) divaricati lepidoti. Calyx circ. 3 mm. longus fere ad basim 5-fissus; cupula dense lepidota; lobi ovati vel elliptici obtusi circ. 2 mm. lati virides extus dense lepidoti. Corolla purpurea postice maculata extus plus minusve albido-lepidota circ. 1.4 cm. longa; tubus circ. 5 mm. longus 4.5 mm. diam. poculiformis; limbus in lobos 5 rotundatos auriculatos imbricatos uninervios explanatus. Stamina 10 alternatim corolla longiora et breviora; filamenta intra tubum corollinum dense albido-villosa. Ovarium 3 mm. longum sulcatum albido-lepidotum; stylus ovarium aequans deflexus sursum expansus stigmate lobulato coronatus. Capsula conoidea lepidum vestigiis vestita circ. 7.5 mm. longa circ. 4 mm. lata stylo persistente aucto coronata.

or yellowish umbo and a fringe papillate at the margin, a few of them larger and longer brown with broad resinous umbo and entire fringe scattered as little points amongst the others, at maturity the surface is cinnamon-coloured or somewhat rufescent and all the scales are coloured alike red and resinous; petiole as much as 1 cm. long lepidote. Flowers about 8 in a short terminal raceme; bud of the inflorescence large globose; outer sterile bracts oblong mucronulate about 6 mm. long 4 mm. broad crustaceous tawny keeled lepidote outside ciliate, inner fertile bracts rounded mucronulate cucullate crustaceous lepidote outside ciliate; pedicels slender 1.2 cm. long (elongating in fruit) divaricate lepidote. Calyx about 3 mm. long 5-cleft nearly to base; cup densely lepidote; lobes ovate or elliptic obtuse about 2 mm. broad green densely lepidote outside. Corolla somewhat rotate deep purple outside more or less lepidote about 1.4 cm. long; tube about 5 mm. long 4.5 mm. diam. cup-shaped beardless traversed by 15 veins 3 to each petal; lobes spreading vertically somewhat unequal posterior largest dark-spotted 6 mm. in diameter auricled imbricate the lateral nerves deliquescing from the base or near it. Stamens 10 alternately long and short, longer about 1 cm. long exserted from the corolla-tube, shorter than corolla; filaments above the naked base (2.25 mm. long) densely whitely villous within the corolla-tube; anthers oblong 2 mm. long. Ovary 3 mm. long sulcate white lepidote; style equalling ovary in length deflexed, expanding upwards into clavate tip crowned in middle by the lobulate stigma. Capsule conoid girt at base by calyx, clad by vestiges of peltate scales, about 7.5 mm. long 4 mm. in diameter about the middle, crowned by the enlarged persistent style.

Bhutan. Toregong Pumthang. Alt. 14,000 ft. Dwarf bush, 2 ft. R. E. Cooper. No. 2224. 23rd Sept. 1914.

Bhutan. Champa Pumthang. Alt. 12,000 ft. 3-ft. bush, loose habit. Purple flowers. R. E. Cooper. No. 4009. 9th June 1915.

Bhutan. Singhi Kurted. Alt. 13,000 ft. 4-ft. bush. In fruit. R. E. Cooper. No. 4285. 2nd Aug. 1915.

An interesting new species of the Lepidotum series finding its nearest ally in *Rh. obovatum*, Hook. f. The leading vegetative character of distinction is the under-leaf indumentum. It is on the adult leaves dark cinnamon-brown and becomes sometimes blood-red and quite like the indumentum of the Anthopogon series. There is no question here of an Anthopogon. The plant has the long pedicels and open beardless somewhat rotate corolla expanded with its face nearly vertical of the Lepidotum series. The leaves are larger than in *Rh. obovatum* and are not

obovate though sometimes approaching it. *Rh. obovatum* has solitary flowers or these are in groups of two to three and then they have the truly umbellate development typical of the Lepidotum series. In *Rh. thyodocum* the axis of the inflorescence is elongated and the several flowers up to 8 come off from it after the method in a raceme.

In all the Lepidotum series the vascular supply to the corolla-limb comes off from the torus in the form of bundles three to each petal (the middle bundle strongest) and these groups of three bundles traverse the corolla-tube to its mouth. At this point one of two distributions occurs. Whilst the middle bundle of the group always runs to the tip of the corolla-lobe to which it belongs the pair of lateral ones may do likewise giving off lateral veins as they ascend. This is the distribution in *Rh. elaeagnoides*, Hook. f., *Rh. lepidotum*, Wall., *Rh. obovatum*, Hook. f., and in *Rh. salignum*, Hook. f.—that is in all the Sikkim species. In others whilst the mid-bundle of each group runs to the tip of a corolla-lobe the adjacent lateral bundles deliquesce at once curving outwards at the base of the lobes and losing themselves in lateral branchings. The corolline lobe then has a conspicuous midrib only from which ascending lateral and spreading lateral branchlets are derived. This second distribution occurs in *Rh. Baileyi*, Balf. f., *Rh. sinolepidotum*, Balf. f., and in *Rh. thyodocum*—that is in the Bhutan, E. Assam and Chinese species.

I am not at all sure that *Rh. thyodocum* is the only distinct Bhutan species. Under No. 1805 Cooper collected at Linghsi Timpu on 24th July 1914 at an elevation of 13,000 ft. a plant in fruit that in some ways resembles *Rh. obovatum* and differs from *Rh. thyodocum*. Further, the N.W. Himalayan plants placed in *Rh. lepidotum* require to be critically compared with those from the E. Himalaya. There seem to be differences between them.

Rhododendron tsarongense,* Balf. f. et Forrest.†

Aromatic shrub some 5 dm. high densely branched. Branchlets of the year barely 1 mm. in diameter brownish-grey furfuraceous

* Tsarong is a district in S.E. Tibet.

† *Rhododendron tsarongense*, Balf. f. et Forrest.—Suffrutex aromaticus ad 5 dm. altus. Ramuli juveniles squamis longe pedicellatis demum resinosis dense induti. Alabastrorum perulae mox deciduae. Folia parva crasse coriacea ad 2.5 cm. longa breviter petiolata; lamina oblonga vel ovali-oblonga ad 2.2 cm. longa 1 cm. lata apice basique obtusa margine recurvata; supra atro-viridis vestigiis squamarum notata; infra nigro-rubiginosa squamulis multi-stratificatis agglutinatis obtecta; petiolus ad 3 mm. longus. Inflorescentia capitulato-racemosa multiflora; pedicelli ad 4 mm. longi. Calyx poculiformis membranaceus circ. 8 mm. longus fere ad basim 5-fissus; lobi oblongi obtusi extus resinoso-lepidoti, longe ciliati. Corolla alba tubo flavo deflexa circ. 1–5 cm. longa; tubus

or sponge-like with a dense coating of stalked imbricate sticky peltate scales in several strata, the stalks stout ending in the longer ones in a narrow umbo and very broad deflexed membranous wing irregular at the margin, the whole like a mushroom, the under scales in varying degrees of development ; a year old slightly thicker and rufescent the scales all more or less full of red resin-like secretion, from some the disks have fallen leaving the red-topped stalks resembling hairs ; older branches soon becoming grey and blackening, then decorticating in soft strips exposing a bright white under bark. Scale-leaves of the fo'iage-bud falling as bud opens ; young foliage-leaves on expansion sticky clad on both surfaces (more densely below) with scales like those on the young twigs, under surface brownish grey. Expanded leaves petiolate as much as 2.5 cm. long ; lamina thick leathery oblong or oblong-oval as much as 2.2 cm. long 1 cm. broad, apex obtuse with a horny apiculus, margin recurved entire, base obtuse ; upper surface dark green with a grooved midrib the venation otherwise hidden, mat or sometimes glistening coated with vestiges usually blackening of the juvenile sticky peltate scales ; under surface with raised midrib and hidden veins, blood-red with peltate scales of different sizes in several strata infiltrated with red secretion and agglutinated to form a somewhat smooth surface in the oldest leaves, in the leaves before maturity the longer scales somewhat furfuraceous ; petiole about 3 mm. long clad like the young stems. Inflorescence a short capituloid terminal raceme many-flowered, rhachis puberulous and lepidote with discoid fleshy scales ; outer bracts unknown, inner fertile bracts persistent during flowering obovate scaphoid obtuse about 7 mm. long 6 mm. broad inside sparsely puberulous, outside puberulous and lepidote, margin ciliate with twisted branched somewhat intertwining hairs ; bracteoles a little shorter than bracts longer than pedicels claviform or spathulate pilose and lepidote on back somewhat membranous at margins above, as much as 1.5 mm. broad ; pedicels short unequal as much as 4 mm. long lepidote often quasi-setulose through fall of disk of scale. Calyx-membranous green or tinted slightly red cupular about 8 mm. long or less ; cup about 2 mm. long 5-lobed ; lobes unequal one sometimes one-third longer than others or all about same length but varying in breadth, as much as 2.5 cm. broad, oblong truncate or rounded often erose hair-fringed at top with long hairs, glabrous inside, puberulous and lepidote outside. Corolla about 1.5 cm. long, limb white, tube

circ. 1 cm. longus extus sparsim lepidotus, intus dense villosus ; limbus subconcavus 5-lobatus tubum subaequans. Stamina 5 ; filamenta puberula. Discus puberulus. Gynaeceum calyce dimidio brevius ; ovarium globosum ; stylus brevissimus clavatus ovario dimidio brevior.

yellow; tube oblique decurved about 1 cm. long at the back 7 mm. long in front somewhat fleshy very sparingly lepidote outside, villous with long hairs from below the middle to the throat inside; limb slightly concave, 5-lobed; lobes rounded about 5 mm. in diameter elepidote. Stamens 5 included equal about 5 mm. long; filaments thin tapered to base finely puberulous in lower third; anther ovoid about 1 mm. long. Disk puberulous below ovary. Gynaeceum about 3 mm. long much shorter than stamens; ovary dome-shaped about 2 mm. long grooved greenish densely lepidote with fleshy stalked different-sized whitish scales; style stout one-half length of ovary clavate ending in a broad flat depressed lobulate stigma.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Alt. 14,000 ft. Lat. 28° 25′ N. Open situations on cliffs and stony slopes. Aromatic shrub of 1–2 ft. Flowers white with tube yellow. G. Forrest. No. 14,334. July 1917.

A species of the Anthopogon series closely allied to *Rh. rufescens*, Franch., from which it differs in the more densely lepidote young shoots, larger oblong or oblong-oval not obovate or suborbicular leaves, the longer petioles, inflorescence more densely flowered, calyx-lobes densely resinously scaly on back not glabrous or with a few hairs, corolla larger slightly lepidote not elepidote, staminal filaments puberulous not glabrous, gynaeceum shorter than calyx not equalling it in length. In the key to the species of the Anthopogon series given in a previous number of the Notes * I stated that the staminal filaments of *Rh. rufescens* are puberulous. This is an error due to an admixture of flowers of two species amongst Soulié's specimens. The staminal filaments are glabrous.

Rehder and Wilson † refer two numbers—3455 and 3930—of Wilson's collecting in W. Szechwan to *Rh. rufescens* pointing out however differences in the foliage—the leaves in Wilson's plant "being oval or elliptic-oblong" not obovate or suborbicular as Franchet describes the leaves in his *Rh. rufescens*. I find in addition that the flower is shorter and has a wider tube than in *Rh. rufescens* and the stamens are puberulous. Wilson's plant may therefore be a distinct form in the phylum. My material is inadequate for a decision.

Some modification is needed of what appears in Mr Millais' book.‡ On p. 237 *Rh. Sargentianum* is given as a synonym under *Rh. rufescens*. On p. 238 *Rh. rufescens* is given as a synonym under *Rh. Sargentianum*. But *Rh. rufescens* and *Rh. Sargentianum* are distinct species. Further there is no record in Forrest's

* Notes Roy. Bot. Garden, Edin., ix (1916), 286.
† Pl. Wilsonianae, i (1913), 503.
‡ Rhododendrons (1917), 237, 238.

collections showing that "Forrest found the species [*Rh. rufescens*] in 1912"; and Forrest's No. 2182 quoted as belonging to *Rh. rufescens* is referred to by Mr Millais on p. 140 under *Rh. cephalanthoides* which it is. Forrest has not collected *Rh. rufescens* which is not a Yunnan plant. In this connection I will point out that in the list of species of the Anthopogon series which I gave on p. 286 of Notes from the Royal Botanic Garden, Edinburgh, ix (1916), Szechwan should replace Yunnan as the native country of *Rh. rufescens*.

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New Species of Enkianthus.

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THE species described in this paper are :—

Enkianthus ferrugineus, Craib, p. 155.
Enkianthus latiflorus, Craib, p. 156.
Enkianthus Palibinii, Craib, p. 157.
Enkianthus pallidiflorus, Craib, p. 157.
Enkianthus pendulus, Craib, p. 158.
Enkianthus recurvus, Craib, p. 159.
Enkianthus sinohimalaicus, Craib, p. 160.
Enkianthus sulcatus, Craib, p. 160.
Enkianthus tectus, Craib, p. 161.

Enkianthus ferrugineus, Craib, sp. n.

Ramuli saepe verticillati, juventute plus minusve rubescentes, angulati, elongati folia saepissime distincte opposita vel subopposita, breves folia rosulata gerentes. Folia obovato-rhomboidea, rhomboidea vel plus minusve elliptica, apice rotundata obtusave, brevissime mucronulata, basi cuneata vel late cuneata, ad 3.5 cm. longa et 2.3 cm. lata, chartacea, supra viridia, primo ad costam nervosque laterales pilis perpaucis instructa, mox fere glabra, subtus pallidiora, ad costae nervorumque lateralium partes basales ferrugineo-pilosa, aliter pilis brevibus ferrugineis adpressis inconspicuis tecta, nervis lateralibus utrinque 3–5 cum costa supra impressis subtus prominentibus intra marginem anastomosantibus, nervis transversis rete laxum subtus conspicuum efficientibus, margine arcte anguste crenulato-serrata, petiolo ad 7 mm. longo supra canaliculato laminaque decurrente anguste alato mox fere glabro suffulta. Flores cum foliis coaetanei, in racemos breves corymbiformes dispositi, bracteis inferioribus foliaceis, pedicellis circa 1 cm. longis superne incrassatis suffulti, rhachi pedicellisque pilis brunneis tenuibus laxe tectis. Calycis segmenta lineari-lanceolata, acuta obtusave, 3·5 mm. longa, 1–1.25 mm. lata, extra inferne indumento ei pedicellorum simili tecta, intra glabra, margine distanter ciliata,

Wt. 8418/143—375—10/19.—N. & Co., Ltd. Gp. 10.

nervis obscuris. Corolla campanulata, circa 6 mm. longa, ad medium 5-lobata, lobis mox patulis apice rotundatis papilloso-ciliolatis. Stamina generis; filamenta 2–2.5 mm. longa, papilloso-puberula, antheris vix 1 mm. longis, aristis 0.5–0.75 mm. longis cum antheris papillosis. Pistillum glabrum, ovario 2 mm. alto, stylo 3 mm. longo.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

In this species the flowers appear along with the leaves instead of just after the leaves as in the others. The shape of the leaves and the short, inconspicuous, adpressed hairs on their lower surface serve to distinguish the species vegetatively.

Enkianthus latiflorus, Craib, sp. n.

Ramuli saepissime verticillati, juniores virides vel plus minusve rubescentes, glabri nisi ad foliorum insertionem paucipilosi, latere utroque conspicue angulati, breves folia aggregata, elongati folia alterna vel subalterna gerentes. Folia oblongo-oblanceolata vel obovato-oblanceolata, apice breviter acuminata, summo apice costa excurrente conspicue apiculata, basi cuneata vel late cuneata, usque ad 4.4 cm. longa et 2.5 cm. lata, rigide chartacea, supra viridia, ad costam nervosque pilis paucis breviusculis erectis instructa, subtus pallidiora, superne glabra, inferne praesertim in axillis sparse pilosa, pilis mox brunnescentibus, nervis lateralibus utrinque 4–6 intra marginem anastomosantibus, costa subtus prominente, margine argute haud alte serrulata, serrulis pilis mox evanidis apiculatis; petioli ad 1 cm. longi, supra conspicue canaliculati, superne latere utroque anguste alati, glabri. Flores in racemos mediocres sessiles dispositi, inferiores in axillis foliorum rosulae superiorum positi, rhachi ad 3 cm. longa, pedicellis ad 1.7 cm. longis cum rhachi sparse brunneo-pilosis praetereaque albo-puberulis; bracteae bracteolaeque parvae, mox deciduae. Calyx 3.5 mm. longus, segmentis deltoideo-lanceolatis vel oblongo-lanceolatis apice nervo mediano excurrente apiculatis 3 mm. longis 1.5 mm. latis indumento specierum aliarum tectis. Corolla ad 1 cm. longa et diametro, lobis rotundatis breviter apiculatis dorso apicem versus carinatis vix reflexis. Stamina generis; filamenta circa 2.5 mm. longa; antherae vix 1.25 mm. longae, sparse setulosae, superne parum ampliatae, aristis 1.5 mm. longis papillosis. Pistillum glabrum; ovarium cum disco pallidiore 2.5 mm. altum, pallide viride, stylo 5.5 mm. longo albo-viridi, stigmate viridi.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

Easily recognised by the almost globose flowers. The pink colour of the corolla scarcely ever goes beyond the corolla lobes except in the veining of the tube.

Enkianthus Palibinii, Craib, sp. n.

Ramuli saepissime verticillati, juventute ad foliorum insertionem paucipilosi, aliter glabri, angulati, virides vel saepius plus minusve rubro-suffusi, elongati folia alterna vel subalterna, breves foliorum rosulam gerentes. Folia oblanceolata vel rarius obovato-oblanceolata, apice plus minusve distincte breviter acuminata, summo apice costa excurrente apiculata, basi attenuato-cuneata, usque ad 4 cm. longa et 1.9 cm. lata, rigide chartacea, supra viridia, sparse pilosa, subtus pallidiora, ad costam inferne sed praecipue in axillis parce pilosa, aliter glabra vel fere glabra, nervis lateralibus utrinque 4–6 intra marginem anastomosantibus, costa subtus prominente, margine argute arcte serrulata, serrulis in pilos mox deciduos productis; petioli ad 10 mm. longi, glabri vel fere glabri, supra anguste altius canaliculati, apicem versus lamina decurrente breviter alati. Inflorescentia terminalis, breviter racemosa, rhachi cum pedicellis sparse brunneo-pilosa praetereaque albo-puberula; pedicelli inferiores ad 15 mm. longi. Calyx 4 mm. longus, segmentis lanceolatis summo apice breviter apiculatis 1.25 mm. latis indumento specierum aliarum tectis. Corolla circa 10 mm. longa, 7–9 mm. diametro, lobis rotundatis paululo reflexis dorso superne carinatis summo apice apiculatis. Stamina generis; filamenta ad 3 mm. longa; antherae 1.25 mm. longae, setulosae, aristis 1.25 mm. longis papillosis. Ovarium 2 mm. altum, cum stylo pallide viridi 5.5 mm. longo sulcato glabrum, stigmate viridi.—? *E. campanulatus* var. *Palibinii*, Bean, Trees and Shrubs, i, 512.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

Distinguished from its allies by the colour of corolla, which in the mature flower is red more or less throughout.

Enkianthus pallidiflorus, Craib, sp. n.

Ramuli saepissime verticillati, juventute nisi ad foliorum insertionem paucipilosi glabri, virides vel parum rubro-suffusi, angulati, elongati folia alterna, breves folia rosulatim aggregata gerentes. Folia lanceolata oblanceolatave, apice nervo mediano excurrente apiculata, basi longe cuneata, usque ad 4 cm. longa et 1.4 cm. lata, satis rigida, supra viridia, ad costam nervosque pilis erectis distanter instructa, subtus pallidiora, ad costam nervosque vel tantum ad costam et praecipue inferne et ibi in axillis sparse pilosa, pilis mox ferrugineis, nervis lateralibus utrinque 4–6 intra marginem anastomosantibus, costa subtus prominente, margine anguste arcte crenulato-serrulata, serrulis in pilos mox delapsos productis; petioli 7–12 mm. longi, supra conspicue canaliculati, apicem versus anguste alati, saepissime glabri. Racemi satis elongati, sessiles, ramulos breves termi-

nantes, rhachi 3–4 cm. longa, cum pedicellis sparse brunneo-pilosa et praeterea albo-puberula, pedicellis inferioribus circa 2 cm. longis. Calycis segmenta lanceolata, apicem versus attenuata, 2.75 mm. longa, 1.25 mm. lata, dorso parce brunneo-pilosa, intra albo-puberula, margine primo longius distanter ciliata, mox ciliolata tantum. Corolla usque ad 9 mm. longa, lobis dorso apicem versus carinatis summo apice apiculatis demum paululo reflexis. Stamina gregis; filamenta circa 2.5 mm. longa; antherae paulo ultra 1 mm. longae, setulosae, aristis 1.25 mm. longis papillosis. Pistillum glabrum; ovarium 2 mm. altum, viride, stylo vix 5 mm. longo inferne sulcato, stigmate glabro.—? *E. nivalis*, Hort. ex Schneider Laubholz. ii, 521—nomen tantum.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

Distinguished by the corolla, which has a faint tinge of pink only here and there on the lobes, and by the distinctly racemose inflorescence.

Enkianthus pendulus, Craib, sp. n.

Ramuli saepissime verticillati, juventute virides vel plus minusve rubro-suffusi, angulati, ad foliorum insertionem pauci-pilosi, aliter glabri, elongati folia alterna, breves folia rosulatim disposita gerentes. Folia lanceolata, ovato-lanceolata vel oblanceolata, apice plus minusve distincte acuminata, summo apice costa excurrente conspicue apiculata, basi cuneata, plerumque circa 30 mm. longa et 18 mm. lata, chartacea, supra viridia, subtus pallidiora, inferne ad costam sed praesertim in axillis parce pilosa, pilis mox ferrugineis, aliter glabra vel fere glabra, nervis lateralibus utrinque 4–6 intra marginem anastomosantibus, costa subtus prominente, margine arcte anguste serrulata, serrulis in pilos mox delapsos productis; petioli circa 1 cm. longi, supra conspicue canaliculati, superne anguste breviter alati, glabri vel fere glabri. Racemi sessiles, ramulos breves terminantes, penduli, conspicue elongati, rhachi 5–6 cm. longa, cum pedicellis 2–2.5 cm. longis parce brunneo-pilosa praetereaque albo-puberula; bracteae saepissime fugaces, parvae. Calycis segmenta lanceolata, apice attenuato-acuta, 3 mm. longa, 1.25 mm. lata, dorso sparse brunneo-pilosa, intra albo-puberula, margine primo longius ciliata mox ciliolata. Corolla 9 mm. longa, lobis dorso superne carinatis summo apice mucronatis demum tantum paululo reflexis. Stamina gregis; filamenta 1.75–2.25 mm. longa, antheris aristis subaequilongis circa 1 mm. longis, antheris breviter setulosis, aristis papillosis. Pistillum glabrum; ovarium viride, 2 mm. altum, stylo pallidiore circa 4.5 mm. longo, stigmate viridi.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

Readily distinguished by the elongate pendulous racemes. The pink in the corolla is practically confined to the veins, there being but a very slight pink tinge in the lobes.

Enkianthus recurvus, Craib, sp. n.

Ramuli saepissime verticillati, juniores nisi ad foliorum insertionem paucipilosi glabri, rubescentes rarius omnino virides, angulati, breves folia rosulam efficientia, elongati folia parum majora alterna rarius subopposita gerentes. Folia oblanceolata vel late oblanceolata, subacuminata vel fere acuminata, summo apice costa excurrente apiculata, basi attenuato-cuneata, usque ad 5 cm. longa et 2.2 cm. lata, chartacea, supra viridia, ad costam nervos nervulosque sparse pilosa, subtus pallidiora saepissime nitida, latere utroque costae inferne pilosa, pilis satis longis mox ochrascentibus, aliter glabra, rarius pilis hic illic instructa, nervis lateralibus utrinque 5–6 intra marginem anastomosantibus pagina utraque conspicuis, costa subtus prominente, margine argute arcte serrulata, serrulis apice pilo mox evanido instructis fere semper haud imbricatis; petioli ad 12 mm. longi, supra conspicue anguste canaliculati, superne latere utroque anguste alati, glabri vel paucipilosi. Racemi terminales, sessiles, axi abbreviato, fasciculum fere spectantes, floribus inferioribus in axi foliorum rosulae superiorum ortis; bracteae bracteolaeque fugaces; rhachis usque ad 3.5 cm. longa, cum pedicellis pilis brunneis transverse pluriseptatis satis longis instructis praetereaque sparse albo-puberulis; pedicelli inferiores ad 2.3 cm. longi, superiores circa 1.2 cm. longi. Calyx 5 mm. longus, segmentis lanceolatis apice attenuato-acutis saepe recurvis 1.5–1.75 mm. latis dorso paucipilosis intra puberulis margine primo longe ciliatis demum pilis pro parte maxima delapsis ciliolatis tantum viridibus albo-marginatis. Corolla primo ambitu oblonga, mox lobis conspicue reflexis campanulata, 11–13 mm. longa, matura apice 10–11 mm. diametro, lobis 2.5–3 mm. longis rotundatis dorso superne carinatis summo apice breviter apiculatis. Antherae 1.5 mm. longae, sparse setulosae, suboblongae, superne parum ampliatae, apiculatae, aristis 1.25 mm. longis papillosis; filamenta gregis, 3.25–3.5 mm. longa. Ovarium cum disco pallido 2.5 mm. altum, circa 2 mm. diametro, stylo 5.75 mm. longo inferne sulcato, stigmate viridi.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

Distinguished from its allies by the size of its flowers and by the conspicuously recurved corolla lobes of the mature flower. The pink of the corolla is usually restricted to the lobes and the veins of the tube, but not unfrequently the pink colour reaches as far as the middle of the tube. In habit this

species reminds one more of the *deflexus* than the *campanulatus* series.

4308 **Enkianthus sinohimalaicus,** Craib, sp. n.

Ramuli elongati nisi ad foliorum insertiones glabri vel fere glabri, folia alterna vel subalterna gerentes, angulati, breves folia rosulatim disposita gerentes. Folia lanceolata lateve lanceolata, apice juventute longe apiculata, basi cuneata, rarius late cuneata vel fere acuminata, circa 5 cm. longa et 2 cm. lata, supra viridia, ad costam nervosque pilis paucis brevibus instructa praetereaque inferne secus costam albo-puberula, subtus pallidiora, glabra vel fere glabra, chartacea, nervis lateralibus utrinque circa 6 intra marginem anastomosantibus supra parum impressis subtus prominulis, costa supra impressa subtus prominente, margine arcte anguste crenulato-serrata, petiolo usque ad 1 cm. longo supra canaliculato lamina decurrente alato puberulo suffulta. Flores in racemos abbreviatos corymbiformes dispositi, bracteis infimis foliaceis ; pedicelli ad 3 cm. longi, superne paulo incrassati, cum rhachi pilis paucis brunneis longioribus instructi praetereaque albo-puberuli ; alabastra oblongo-obovata, ante anthesin distincte longiora quam latiora. Calycis segmenta plus minusve deltoidea, obtusa, circa 2 mm. longa et lata, albo-marginata, ciliolata. Corolla 1 cm. longa, lobis dorso haud carinatis et haud apiculatis papilloso-ciliolatis. Stamina generis ; filamenta 3–3.5 mm. longa, antheris 1.5 mm. longis setulosis, aristis circa 1 mm. longis brevius setulosis. Ovarium cum disco circa 2 mm. altum, puberulum, stylo 5 mm. longo pallido pilis subrigidis divaricatis inferne instructo, stigmate viridi.

Cult. Hort. Bot. Reg. Edin. Hab. Szechwan.

Raised from Wilson's Chinese seed received as *E. deflexus*. In flower this species resembles very closely *E. himalaicus*, from which it may be distinguished by the almost glabrous lower leaf surface, as also by the finer and sharper lateral nerves as seen on the lower surface. This species and *E. himalaicus* may be distinguished from *E. sulcatus* by their flower buds, which are longer than broad, and in which the grooves alternating with the corolla lobes run about half-way down to the calyx tip. In *E. sulcatus* the flower bud just before expansion is broader than long, and the grooves run right down to the calyx tips.

4301 **Enkianthus sulcatus,** Craib, sp. n.

Ramuli elongati folia alterna vel subalterna gerentes, angulati, nisi ad foliorum insertionem glabri vel fere glabri, breves folia in rosulam disposita gerentes. Folia lanceolata vel latius

oblongo-lanceolata, apice longius mucronato-acuminata, basi cuneata vel rotundato-cuneata, decurrentia, ad 6 cm. longa, 3 cm. lata, rigide chartacea, supra viridia, demum rubescentia, primo pilis sat robustis rectis densius instructa, pilis cito apice brunnescentibus demum basibus tantum persistentibus praetereaque plus minusve inconspicue albo-puberula, subtus pallidiora, ad costae nervorumque lateralium inferiorum partes basales pilis rigidis albis apice mox brunnescentibus subdense instructa, aliter pilis brevioribus ferrugineis adpressis sparse tecta, nervis lateralibus utrinque 6–8 cum costa supra plus minusve impressis subtus prominentibus intra marginem anastomosantibus margine argute serrulata, petiolo ad 1 cm. longo puberulo supra canaliculato lamina decurrente alato suffulta. Racemi abbreviati, bracteis inferioribus foliaceis, pedicellis circa 3 cm. longis superne incrassatis cum rhachi pilis longis brunneis sparse instructis praetereaque albo-puberulis; alabastra depresso-globosa vel late ovata, ante anthesin latiora quam longiora, 5-sulcata, sulcis calycis apicem attingentibus. Calycis segmenta parum variabilia, 4–4.5 mm. longa, 1.5–2.5 mm. lata, lanceolata vel ovato-lanceolata, apice longe attenuata acuminatave, mucronulata, dorso pilis paucis longiusculis adpressis instructa vel fere glabra, intra superne puberula, conspicue albo-marginata, ciliolata. Corolla 1 cm. longa, basi fere truncata, circa 1 cm. diametro, lobis papilloso-ciliolatis saepissime breviter apiculatis. Stamina generis; filamenta 2.5–3 mm. longa, basi expansa pilosa, superne brevius papilloso-setulosa, antheris circa 1.75 mm. longis setulosis, aristis 1.25–1.5 mm. longis papilloso-puberulis. Ovarium 3 mm. altum, viride, basi pallidum, puberulum nisi apice breviter pilosum; stylus 4.5 mm. longus, pallidus, pilis divaricatis basem prope ornatus, superne glaber, stigmate viridi.

Cult. Hort. Bot. Reg. Edin. et Caerhys. Hab. Szechwan.

Raised from Wilson's seed, this species must be included in the Plantae Wilsonianae under the name *E. deflexus*. The character drawn from the flower bud readily distinguishes the plant from the Himalayan species.

Enkianthus tectus, Craib, sp. n.

Ramuli saepissime verticillati, juventute plus minusve rubro-suffusi, ad foliorum insertionem paucipilosi, aliter glabri, angulati, elongati folià alterna rarius subopposita, breves foliorum rosulam gerentes. Folia quoad formam parum variabilia plerumque oblanceolata vel obovato-oblanceolata vel rarius fere obovata, apice acuminata, summo apice costa excurrente apiculata, basi cuneata angusteve cuneata, saepissime circa 2.5–3 cm. longa et 1–1.6 cm. lata, satis rigida, supra ad costam

nervosque pilis erectis plus minusve sparse instructa, subtus nitida, pallidiora, inferne ad costam nervosque laterales vel tantum ad costam sed praecipue in axillis parce pilosa, nervis lateralibus utrinque 4–6 intra marginem anastomosantibus, costa subtus prominente, margine argute anguste crenulato-serrulata, serrulis apice in pilos mox deciduis productis saepissime imbricatis; petioli ad 7 mm. longi, supra conspicue canaliculati, apicem versus breviter anguste alati, fere semper omnino glabri. Racemi sessiles, abbreviati, ramulos breves terminantes, rhachi 2–2.5 cm. longa, pedicellis 7–15 mm. longis cum rhachi parce brunneo-pilosis praetereaque albo-puberulis; bracteae bracteolaeque parvae. Calycis segmenta lanceolata, 3 mm. longa, 1.25 mm. lata, primo longius distanter ciliata, mox pilis deciduis ciliolata, intra albo-puberula. Corolla circa 9 mm. longa, lobis rotundatis haud raro breviter apiculatis cito paulo reflexis. Stamina gregis; filamenta 2.5–2.75 mm. longa; antherae vix 1 mm. longae, superne ampliatae, cum aristis circa 1 mm. longis papilloso-puberulis. Pistillum glabrum; ovarium 1.75 mm. altum, 1.5 mm. diametro, viride, stylo 5 mm. longo pallide viridi inferne sulcato, stigmate viridi.

Cult. Hort. Bot. Reg. Edin. Hab. Japan.

The short dense flowered fascicle-like racemes overspread by the leaves characterise this plant. The pink colour of the corolla is confined to the lobes and the veining of the tube.

Hardy Species of Enkianthus under Cultivation in the Royal Botanic Garden, Edinburgh.

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ATTEMPTS, some years ago, to arrange the herbarium material of *Enkianthus*, and more especially of the *campanulatus* series of the genus, only served to prove that this genus, like so many of its allies, must be studied from living material. Since my transference to Edinburgh my attention has been directed by the Regius Keeper to the material under cultivation in the Royal Botanic Garden.

In spite of the comparatively recent revisions of the genus by Palibini,* Wilson,† and Schneider,‡ great confusion apparently still exists. The experience of this establishment is not an isolated one. Attempts to purchase *E. cernuus* and *E. subsessilis* direct from Japan have always resulted in the addition to the collection of plants of the *campanulatus* series. Failure, however, to introduce the two species named has resulted in our having here a set of the *campanulatus* series which contains some very distinct plants.

At present only two of the groups of the genus are represented among our hardy plants, viz. the *perulatus* group represented by *E. perulatus* and the *campanulatus* group in which two distinct geographical series may be recognised: (1) the series of true *campanulatus*, with glabrous pistil, all natives of Japan, and (2) the *deflexus* series with hairy pistil, inhabitants of E. Himalaya and W. China.

No difficulty attaches to the recognition of *E. perulatus* or, as it is probably more widely known under cultivation, *E. japonicus*, either from vegetative or from floral characters. Vegetatively probably the most distinctive character is to be found in the course of the petiole with respect to the branchlet. The petiole is adpressed to or at least parallel to the branchlet throughout its length, the lamina alone spreading obliquely

* Script. Hort. Bot. Petrop., xv, p. 8. † Gard. Chron., xli (1907), p. 311.
‡ Laubholz. ii, p. 519.

from the branchlet. Another feature is found in the nerves of the lower surface where only the lower part of the midrib is elevated. In flower the shrub may be easily recognised by the terminal umbels of few, white, urn-shaped flowers each with five very prominent nectaries.

E. subsessilis (syn. *E. nikoensis*), which is not very common in cultivation, agrees with *E. perulatus* in having white urn-shaped flowers and in the pedicels in fruit being straight. The close, fine reticulation of the leaf affords a useful diagnostic mark, as does also the row of short white erect hairs along the midrib on the upper surface. The flowers again have not got the prominent nectaries, and they are arranged in a raceme and not in an umbel.

As already indicated, the species of the *campanulatus* type may be grouped in two series: (1) the western series which may be referred to as the *deflexus* series after the name of the first described species, and (2) the eastern or true *campanulatus* series. The most reliable character for separating these two groups is found in the pistil, which is hairy in the former and glabrous in the latter. Besides this character we find that plants of the *deflexus* series are not as a rule so bushy as those of the true *campanulatus* series, that the former have larger, coarser leaves and larger flowers, and that the raceme is much more abbreviated. These characters, however, while holding for the majority are by no means absolute, *e.g.* as will be noted in due course, one of the species of the true *campanulatus* series is in habit very similar to the plants of the other series.

The *deflexus* series is represented here by the well-known E. Himalayan plant and, of the more recent introductions, by two of Wilson's Chinese plants, both of which have been referred by their collector to the Himalayan species, as also by some younger plants of still more recent introduction which have not yet flowered. In the absence of flowering material these latter must meanwhile be left out of consideration.

Although I have referred to this series as the *deflexus* series I cannot at present follow Schneider and Wilson in adopting Griffith's name *deflexus* for the Sikkim plant, which is the plant in cultivation. Griffith gave the name *deflexus* to his Bhutan plant, and of his original collection I have seen but poor dried material. Recent collections made in Bhutan by Mr. R. E. Cooper contain specimens of an *Enkianthus* which are exactly similar to Griffith's plant, and since Griffith's and Cooper's material agrees exactly with nothing I have seen from Sikkim I am forced to keep the two plants distinct and to refer to the Sikkim plant as *E. himalaicus*.

Again I cannot agree with Wilson in referring his plants to

either of the two E. Himalayan species. The shrubs raised from Wilson's seed flowered here this year, and represent two species which, as pointed out in the key, may be easily distinguished from flower bud characters.

With regard to the true *campanulatus* series, the first difficulty one is faced with is—what is the true plant described by Miquel? or rather, since the present article is concerned with the plants under cultivation here, does our collection contain the plant originally described by Miquel as *Andromeda campanulata*? Miquel gives us a lengthy and precise account of his species, and from that description it is at once evident that our plants with large leaves, large flowers and elongate racemes may be excluded from *E. campanulatus*. This exclusion narrows down our choice to one or possibly two plants which agree with Miquel's description in having the smaller flowers and abbreviated racemes, though both have slightly larger leaves than Miquel describes. But neither of these plants accords with Miquel's diagnosis. Apart from the slightly larger leaves, the flowers do not quite arise with the leaves, the pedicels are shorter, etc. After due consideration I have come to the conclusion that it would not be judicious to regard any one of our plants as *E. campanulatus* sensu stricto. As already remarked, Miquel's description is very full, and until we get a plant which differs less from that description than any of our plants here do, it would not be advisable to use Miquel's specific name.

There is one more very distinct hardy plant in cultivation in this country though it is not yet represented in our collection here, viz. *E. cernuus*. The fimbriate margin of the corolla immediately distinguishes the plant. Allied to this species, if not identical with it, is the recently published *E. Matsudai*, Komatsu. Of *E. Matsudai*, however, I have seen neither specimens nor the published figure, the conclusion as to its affinity or identity being drawn solely from the somewhat generalised description.

There are still several species of the genus of which I have seen no living specimens. Of the *deflexus* series there are the true *E. deflexus* from Bhutan,—*E. brachyphyllus*, *E. chinensis*, *E. Rosthornii* and *E. pauciflorus* from W. China. From experience of the genus in both dried and living specimens I cannot for the present subscribe to the published verdict that *E. chinensis* and *E. brachyphyllus* are synonymous or that they are to be regarded as varieties of a Himalayan species. Nothing can be said of *E. Rosthornii* except that the species is based on quite incomplete material. *E. pauciflorus* with its few flowers should be very distinct, but though at one time in cultivation I have been unable to obtain living specimens. Of the *cernuus*

series there are *E. Matsudai*, which has already been referred to, and *E. nipponicus*, which differs from *E. cernuus* in the relatively shorter corolla and filaments. The genus has been further enlarged by Léveillé, but the inadequate descriptions provided preclude any remarks on his species unless it be to hazard a guess that some of them are allied to the tender *E. quinqueflorus* while others may belong to the *deflexus* series.

With regard to the cultivation of the various species, it has often been asserted that they are not perfectly hardy and that *E. himalaicus* should be wintered indoors. That is not the experience here.

On the light alluvial soil of these gardens all are perfectly hardy, and as regards the plant of *E. himalaicus*, Professor Balfour informs me he has known that plant for at least twenty years, during which period it has been transplanted frequently and has never been under glass. This year some of the plants in exposed situations had many of their flower buds cut by the exceptional late frosts and persistent cold winds, but vegetatively they were not damaged.

The following key has been based on the plants under cultivation here, and includes only such plants as have flowered during the last two years :—

KEY TO THE SPECIES.

Petiole not grooved above, adpressed to or at least parallel to the branchlet throughout its length, midrib (except at base) and lateral nerves not elevated on the lower surface which is polished, flowers white, urn-shaped, fascicled, nectaries very prominent . . . . . *perulatus.*

Petiole grooved above, spreading obliquely from the branchlet, midrib and lateral nerves more or less elevated on the lower surface which is polished or not, corolla cup-shaped to campanulate, red, tinged with red or almost white, nectaries but very slightly prominent.

Ovary and style glabrous (*campanulatus* series).

Undersurface of leaves in addition to the long uniformly rusty hairs on the midrib and lateral nerves thinly covered with shorter adpressed rusty hairs, leaves mostly more or less rhomboid in outline, flowers appearing with the leaves . . . . . *ferrugineus.*

Undersurface of leaves without the rusty adpressed short hairs, leaves mostly lanceolate to oblanceolate or broadly so, flowers appearing shortly after the leaves.

Corolla cup-shaped to almost orbicular . . *latiflorus.*

Corolla more or less campanulate.

Corolla 11–13 mm. long, the lobes very soon markedly reflexing, pink colour confined to the lobes and veining of the tube or sometimes extending to the tube between the lobes . . . . . *recurvus.*

Corolla up to 10 mm. long, the lobes not or at length but slightly reflexing.
Corolla pink almost throughout . . *Palibinii.*
Corolla tube pink only on veins or nearly white throughout.
Corolla white nearly throughout, flowers arranged in quite evident racemes . . *pallidiflorus.*
Corolla with pink colour more or less conspicuous.
Flowers arranged in long pendulous racemes, not at all hidden by the foliage . . *pendulus.*
Flowers arranged in fascicle-like racemes, more or less concealed from above by the foliage . . . . . *tectus.*
Ovary and style not glabrous (*deflexus* series).
Flower buds depressed globose to very broadly ovate, broader than long just before expansion, sharp grooves on corolla alternating with the lobes running right down to calyx segments, lower surface of leaf with long coarse scattered hairs on midrib and shorter finer adpressed hairs all over . . . . . *sulcatus.*
Flower buds oblong or obovate-oblong, longer than broad, grooves on corolla alternate with the lobes not extending much more than half-way to the calyx segments.
Undersurface of mature leaves with indumentum as described in *E. sulcatus* . . . *himalaicus.*
Mature leaves glabrous or nearly so on undersurface . . . . . *sinohimalaicus.*

ADDENDA.

Since the above paper was written Léveillé's herbarium, generously presented by A. K. Bulley, Esq., and Major Lionel de Rothschild, has been received at the Royal Botanic Garden, Edinburgh.

An examination of the type specimens in this herbarium shows :—

1. *E. xanthoxantha, E. Dunnii, and E. Cavaleriei* belong to the *quinqueflorus* alliance. The material of each of these three species consists of one gathering only, and is insufficient for satisfactorily determining their relationship. Probably *E. Dunnii* and *E. Cavaleriei* are synonymous.

2. *E. cerasiflora* (syn. *Zenobia cerasiflora*) belongs to the *campanulatus* series. In his 'Flore de Kouy-Tcheou' Léveillé reduces *E. Cavaleriei* to *E. cerasiflora*, but the two species really belong to different groups of the genus. There is no indication as to whether *E. cerasiflora* is cultivated or not. If this plant is truly native in Kouy-Tcheou, then the statement in the body of the paper, that all the species of the *campanulatus* series are

natives of Japan, no longer holds. *E. latiflorus* is very near to this species.

3. *Bodinierella Cavaleriei* is founded on an *Enkianthus* of the *deflexus* series, and as the specific name is already occupied in the genus, a new name must be given to the plant :—

Enkianthus Leveilleanus, Craib, nom. nov.

Bodinierella Cavaleriei, Lévl. in Fedde Rep. Nov. Sp., xii, p. 101 (1913).

Two additional species have been added recently to the outdoor collection here : *E. cernuus* var. *rubens*, a native of Japan, and *E. serrulatus*, a native of W. China.

E. cernuus and its variety, as already indicated, are readily distinguished from the species enumerated in the key by their fimbriate corolla lobes. In all the species enumerated in the key the corolla lobes are entire.

E. serrulatus differs from the *campanulatus* and the *deflexus* series and agrees with *E. perulatus* in its fascicled flowers, the pedicels of which are straight and erect in fruit. I believe Schneider to be right in regarding this as a distinct species and not as a variety of *E. quinqueflorus*, as originally proposed by Wilson.

New Species of Primula.

BY

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THE following new species are described :—

*P. aequipila, Craib (Petiolaris), p. 169.
P. drymophila, Craib (Petiolaris), p. 170.
P. epilosa, Craib (Petiolaris), p. 171.
P. euosma, Craib (Petiolaris), p. 172.
P. fagosa, Balf. f. et Craib (Petiolaris), p. 172.
P. Harsukhii, Craib (Denticulata), p. 173.
P. leptophylla, Craib (Petiolaris), p. 174.
P. limnoica, Craib (Denticulata), p. 175.
P. macropoda, Craib (Petiolaris), p. 176.
P. polia, Craib (Petiolaris), p. 177.
P. praticola, Craib (Petiolaris), p. 178.

1381

Primula aequipila, Craib (Petiolaris).

Rhizoma crassum vel subcrassum ; squamae basales tenues, brunneae, diu persistentes, ad 15 mm. longae, superne saepe dentatae, ciliolatae. Folia omnia basalia, suberecta, oblonga, elliptica vel subquadrato-elliptica, apice rotundata truncatave, saepe late retusa, basi rotundata vel subacuminata, usque ad 10 cm. longa et 7.3 cm. lata, rigide chartacea, supra viridia, pilis minutis albis capitatis farini-potentibus sparse instructa, et ad costam inferne pilis elongatis transverse septatis densius tecta, subtus pallidiora, costa pilis iisdem elongatis tecta, aliter pilis brevioribus sed nequaquam parvis transverse septatis subaequaliter vix dense tecta, costa supra pallescente lata subtus prominente, nervis lateralibus utrinque 8–11, supra saepe pallescentibus parum impressis subtus prominentibus, nervulis in foliis maturis reticulationem laxam subtus prominulam supra plerumque impressam formantibus, margine subcrenulata, hydathodo-denticulata, dentibus saepissime recurvis ; petioli usque ad 5 cm. longi, pilis elongatis transverse septatis densius pilosi, praetereaque pilis brevibus farini-potentibus sparse instructi. Pedunculi communes solitarii, 8.5–17 cm.

* For key to the new species described here of the *Davidii* alliance and to their allies see p. 181.

[Notes, R.B.G., Edin., No. LIV, October 1919.]

alti, indumento ei petiolorum sed multo sparsiore simili tecti; bracteae tenues, brunneae, lineari-lanceolatae vel e basi lata lineari-lanceolatae, circa 8 mm. longae, ciliolatae; umbellae ad 7-florae, pedicellis 8–15 mm. longis indumento ei pedunculi simili tectis. Calyx viridis, dorso indumento ei pedunculi simili tectus, 9–10 mm. longus, ad medium lobatus, lobis variabilibus 3–4 mm. latis ciliolatis 3–5-nerviis nervis rectis subrectisve apice haud anastomosantibus. Corollae tubus in flore longistylo circa 11 mm. longus, apice annulatus, in flore brevistylo circa 13 mm. longus, exannulatus; limbi lobi circa 12 mm. longi et 10 mm. lati, apice late retusi et in sinus fundo apiculati. Antherae oblongae, circa 2.25 mm. longae, filamentis circa 0.75 mm. longis basem versus expansis et ima basi connatis itaque annulum minorem fere efficientibus in flore longistylo circa 5 mm. et in flore brevistylo circa 11 mm. supra corollae tubi basem insertis suffultae, in flore longistylo in calyce inclusae et in brevistylo e calyce omnino exsertae. Ovarium 1.5–2 mm. altum, stigmate in flore longistylo exserto, in brevistylo in calyce bene incluso, stylo cum stigmate capitato in flore brevistylo circa 5 mm. longo.

China. Hupeh, Changyang, wet places, 5600 ft. Flrs. purple. Wilson, 52 (Herb. Edin. et Kew). Flr. iv, 00.

Primula drymophila, Craib (Petiolaris) ab affini *P. sonchifolia,* Franchet, antheris in flore longistylo partim haud omnino e calyce exsertis distinguenda.

Herba 10–20 cm. alta (fide *Wilson*), rhizomate squamisque basalibus in specimine unico deficientibus. Folia sub anthesin haud matura, oblongo-elliptica, apice rotundata, basi in petiolum latum angustata, circa 5 cm. longa et 2·8 cm. lata, membranacea vel rigide membranacea, pagina utraque viridia, et pilis brevibus capitatis farini-potentibus sed inferiore paulo densius conspersa, nervis lateralibus utrinque circa 8 subtus prominulis bene intra marginem ramosis, margine subaequaliter lobulata, lobulis circa 4 mm. longis et 5 mm. latis eroso-denticulatis dentibus hydathodo terminatis, petiolo ad 2.5 cm. longo membranaceo-alato inferne vaginante suffulta. Pedunculus communis floriferus 6 cm. altus, pilis capitatis farini-potentibus puberulus, 5-florus; bracteae oblongae vel ovato-lanceolatae, apice obtusae vel obtuse subacuminatae, 4–4.5 mm. longae, dorso pilis paucis brevibus capitatis instructae vel fere glabrae, pilis iisdem ciliolatae; pedicelli 11–13 mm. longi, indumento ei pedunculi simili tecti. Calyx viridis, dorso ut pedicelli puberulus, campanulatus, circa 5 mm. longus, ad medium vel paululo ultra medium 5-lobatus, lobis imbricatis plus minusve obovato-oblongis apice variabilibus acuminatis vel tridentatis ciliolatis.

Corolla violacea (fide *Wilson*), extra supra calycis apicem ad loborum medium sed superne sparsius puberula; tubus floris longistyli 9 mm. longus, infra stamina angustatus, superne gradatim paulo expansus, apice distincte annulatus, annulo 10-lobato, lobis antipetalis magnis alternipetalis parvis, intra supra stamina pauci-pilosus; discus 1.75 mm. latus; limbus totus 13 mm. latus, supra praesertim inferne sparse pilosus; lobi elliptico-obovati, apice undulati vel undulato-denticulati, circa 10 mm. longi et lati. Antherae oblongae, 2 mm. longae, floris longistyli parte dimidia inferiore in calyce inclusa, filamentis circa 0.5 mm. longis circa 3.5 mm. supra corollae tubi basem insertis suffultae. Ovarium 2 mm. altum, stylo longo cum stigmate capitato 7.5 mm. longo.

Western Szechwan, Tachien-lu, 9000–11,000 ft. Herb 4–8 inches; flowers violet; in woodlands. Wilson, 1081 quoad exemplum floriferum (Herb. Edin.).

Primula epilosa, Craib (Petiolaris).

Rhizoma crassum subtenueve, lignosum; squamae basales persistentes vel deciduae, brunneae, tenues, ad 12 mm. longae, apicem versus saepe denticulatae, ciliolatae. Folia omnia basalia, suberecta, oblonga, oblongo-obovata vel fere elliptica, apice rotundata, haud rarius late retusa, basi cuneata, 5.5–8 cm. longa, 2.6–4 cm. lata, rigide chartacea, supra viridia, subtus pallidiora, pagina utraque pilis brevibus capitatis farini-potentibus conspersa, nervis lateralibus utrinque saepissime 12–15 supra saepe parum impressis subtus prominentibus, costa supra pallescente subtus prominente, nervulis reticulationem subtus saepe prominentem formantibus, margine crenata vel crenato-lobulata, hydathodo-denticulata dentibus saepissime recurvis, ciliolata, petiolo lamina decurrente alato vix distincto vel ad 15 mm. longo indumento ei laminae simili instructo suffulta. Pedunculi communes solitarii, in exemplo unico florifero 4.5 cm. longi, in exemplis fructiferis usque ad 21 cm. longi, pilis brevibus capitatis farini-potentibus albis conspersi, 1–6-flori; bracteae brunneae, e basi lata longius acuminatae, rarius lineari-lanceolatae, 6–7 mm. longae; pedicelli floriferi 8 mm. longi, fructiferi superne incrassati, ad 21 mm. longi, indumento ei pedunculi simili tecti. Calyx viridis, dorso pilis brevibus farini-potentibus puberulus, intra tubi apicem versus inter lobos similiter puberulus, sub anthesin (sicco) 9.5 mm. longus, infructescens paulo ultra 10 mm. longus, vix ad medium lobatus, lobis ad 5 mm. latis apice variabilibus saepissime acuminatis acutis vel subobtusis 5–7-nerviis ciliolatis. Corollae floris longistyli tubus sicco 10.5 mm. longus, lobi 13 mm. longi, 11 mm. lati, apice bilobulati. Antherae in calyce inclusae sed e calycis tubo

bene (an omnino ?) exsertae. Stylus longus corollae tubo subaequialtus, brevis in fructu calycis lobis dimidio brevior, stigmate capitato. Capsula in calycis tubo inclusa.

W. China. Wet rocks, 6000 ft. Flrs. purple. Wilson, 4048 (Herb. Kew).

Of this species I have seen but one corolla—a long-styled one—and the measurements are consequently taken in the dry condition.

Primula euosma, Craib (Petiolaris), ab affini *P. odontocalyce,* Pax, calycis lobis longe subacute attenuato-acuminatis integris distinguenda.

Herba nana, scaposa, rhizomate breve radices fibrosas numerosas emittente ; squamae basales sub anthesin delapsae. Folia subdensa, saepissime elliptica vel obovata, apice rotundata, basi in petiolum attenuata lateve cuneata, ad 3 cm. longa et 2.3 cm. lata, rigide membranacea, viridia sed subtus pallidiora, pagina utraque pilis brevibus farini-potentibus sparse instructa, nervis lateralibus utrinque circa 6 erecto-patentibus supra vix conspicuis subtus conspicuis, margine argutius denticulata, denticulis hydathodo-apiculatis, subsessilia vel petiolo usque ad 1.5 cm. longo suffulta. Pedunculi communes solitarii, 3–5 cm. alti, 3–7-flori, pilis farini-potentibus puberuli vel superne fere sparse farinosi ; bracteae angustae, circa 6 mm. longae ; pedicelli 10–15 mm. longi, indumento ei pedunculi simili tecti. Calyx viridis, campanulatus, 7 mm. longus, lobis oblongo-ovatis longius subacute acuminatis circa 4.5 mm. longis et 2.5 mm. latis breviter dense ciliolatis. Corollae floris longistyli tubus exannulatus, vix 10 mm. longus, limbo circa 1.2 cm. lato, disco 2.5–3 mm. lato ; lobi circa 10 mm. longi et lati, parum irregulariter denticulati sed saepissime anguste bilobulati, lobulis denticulatis. Antherae 2 mm. longae, breviter apiculatae, in calyce inclusae, filamentis brevibus antheris obtectis circa 3.5 mm. supra corollae basem affixis suffultae. Ovarium 1.5 mm. altum, stylo longo circa 6 mm. longo, stigmate depresso-globoso circa 0.75 mm. longo.

Yunnan. Shweli-Salwin divide, 10,000–11,000 ft. Lat. 25° 30′ N. Plant of 2–4 inches. Flowers soft purplish-rose with eye greenish-yellow, fragrant. Shady situations by streams. G. Forrest, 15772. Fl. July 1917.

Primula fagosa, Balf. f. et Craib (Petiolaris).

Rhizoma crassum, lignosum, radices sat crassas numerosas emittens ; squamae basales suboblongae, circa 2 cm. longae, tenues, brunneae, medium versus pallescentes, pilis minutis farini-potentibus albis conspersae, ciliolatae. Folia omnia basalia,

oblonga, oblongo-obovata vel subelliptica, apice rotundata, saepe late haud alte retusa, basi cuneata, usque ad 13.5 cm. longa et 7 cm. lata, chartacea vel coriaceo-chartacea, supra sicco iuventute fusca, matura fusca brunneave, pilis parvis inconspicuis farini-potentibus sparse instructa, praetereaque ad costae partem inferiorem pilis longioribus transverse septatis hic illic ornata, subtus matura pallidiora, farina alba (an semper ?) sparse tecta et ad costam nervosque pilis longioribus transverse septatis ornata, costa supra pallescente, nervis lateralibus utrinque 12–13 supra conspicuis saepe parum impressis subtus cum costa prominentibus, nervulis rete conspicuum supra interdum immersum subtus prominens formantibus, subsessilia vel petiolo vix distincto alato ad 1 cm. longo suffulta. Pedunculi communes solitarii vel in exemplo unico bini, umbellam simplicem 3–6-floram vel in exemplo fructifero umbellam terminalem paucifloram et verticillum inferum plurifloram gerentes, 6–12 cm. alti, pilis longiusculis transverse septatis sparsius vel subdense tecti praetereaque pilis brevibus farini-potentibus instructi; bracteae brunneae, e basi lata caudato-acuminatae, circa 5 mm. longae; pedicelli 8–18 mm. longi, indumento ei pedunculi simili tecti, infructescentes superne conspicue incrassati. Calyx brunneus, 9 mm. longus, extra indumento ei pedicellorum simili tectus, ad medium lobatus, lobis 3.5 mm. latis breviter acuminatis ciliolatis, nervis 3–5 rectis vel subrectis obscuris. Corollae floris brevistyli tubus circa 14 mm. longus, exannulatus, lobi circa 11 mm. longi et 9–10 mm. lati, apice late retusi et in sinus fundo apiculati. Antherae oblongae, 2.75 mm. longae, filamentis 1-1.25 mm. longis inferne parum dilatatis in flore brevistylo circa 11.5 mm. e corollae tubi base affixis suffultae, in flore longistylo in calyce inclusae. Ovarium 2.5 mm. altum; pistillum floris brevistyli calyci vix aequialtum, stigmate capitato. Capsula in calycis tubo inclusa, seminibus fuscis angulatis foveolatis.

W. China. E. Szechwan, Tchen-kéow-tin, Farges, 119 (Herb. Edin. et Kew).

Primula Harsukhii, Craib (Denticulata), a *P. denticulata*, Sm. foliis squamiformibus magnis, involucri bracteis minoribus, floribus distincte pedicellatis distinguenda.

Rhizoma breve, crassum, radices elongatas crassas emittens; folia squamiformia exteriora latissime ovata, circa 2.4 cm. longa et 2 cm. lata, interiora gradatim longiora et angustiora, intima oblonga, usque ad 5 cm. longa, omnia rigida, erecta, arcte adpressa, apice acuminata, margine superne denticulata, arcte revoluta, utrinque pilis brevibus capitatis farini-potentibus inconspicue puberula vel interdum sparse irregulariterque sul-

phureo-farinosa. Folia floribus coaetanea vel sub anthesin vix evoluta, oblongo-lanceolata vel oblongo-spatulata, apice obtusa rotundatave, basi in petiolum latum angustata, paulo post anthesin ad 9 cm. longa et 2.8 cm. lata, rigide chartacea, pagina utraque pilis capitatis farini-potentibus puberula vel saepe inferiore plus minusve sulphureo-farinosa, nervis lateralibus utrinque 10–14, supra subconspicuis subtus prominentibus, nervis transversis obscuris vel paucis subtus subprominulis, margine subregulariter hydathodo-denticulata, ciliolata, petiolo late membranaceo-alato vix distincto ad 3.5 cm. longo suffulta. Pedunculi communes solitarii, 8–11 cm. alti, pilis farini-potentibus puberuli et summo apice pallide luteo-farinosi; bracteae involucrales saepissime late ovato-deltoideae, obtusae, pedicellis distincte breviores, rarius pedicellis subaequales, puberulae, ciliolatae; pedicelli usque ad 5 mm. longi, pilis farini-potentibus dense tecti vel pallide farinosi, apice anthopodio distincto terminati. Calyx pilis farini-potentibus extra sparse puberulus, 6.5 mm. longus; lobi 4–5 mm. longi, circa 1.5 mm. lati, lineari-lanceolati, obtusi, unicostati, intra pilis longiusculis capitatis instructi, ciliolati. Corollae tubus circa 11 mm. longus, extra puberulus, exannulatus, haud rugosus; limbi lobi circa 4.5 mm. longi et 3.25 mm. lati, apice lobulati, sinu circa 1.5 mm. alto. Antherae lineari-oblongae, loculis basi apiceque liberis, filamentis brevibus in flore longistylo 5 mm. in brevistylo circa 7.5 mm. supra corollae basem insertis suffultae. Ovarium depresso-globosum, 1.75 mm. altum; stylus longus 6 mm., brevis 2.25 mm. stigmate capitato incluso longus.

Kurram Valley, Harsukh, 14894 (*type*), 14909 (Herb. Edin. et Kew); Bian Khél, Aitchison, 130 (Herb. Kew).

N.W. Frontier Provinces, S. Waziristan, Pir Ghal, 8000–11,500 ft., Harsukh, 15602 (Herb. Calc.).

1386

Primula leptophylla, Craib (Petiolaris).

Rhizoma crassum, lignosum, radices fibrosas valde numerosas emittens; squamae basales numerosae, membranaceae, persistentes, saepissime circa 15 mm. longae, pilis minutis capitatis inconspicuis sparsissime instructae, brunneae. Folia omnia basalia, suberecta, oblongo-elliptica, elliptica, oblongo-obovata vel obovata, apice rotundata, saepe retusa, basi saepissime cuneata vel acuminata, ad 8 cm. longa et 5.2 cm. lata, membranacea vel rigide membranacea, viridia, pagina superiore pilis minutis albis farini-potentibus sparsius instructa, rarissime costae imam basem versus pilis longioribus paucissimis instructa, inferiore pilis minutis albis farini-potentibus subdense tecta, praetereaque costa nervisque lateralibus pilis elongatis transverse septatis pilosa, nervis lateralibus utrinque saepissime 9

supra conspicuis subtus prominulis, margine anguste crenata et hydathodo-denticulata, ciliata ; petioli ad 5 cm. longi, lamina decurrente anguste alati, pilis elongatis transverse septatis pilosi et pilis minutis farini-potentibus sparse instructi. Pedunculi communes solitarii vel bini, infructescentes 9–14 cm. alti, indumento ei petiolorum simili sed nisi summo apice sparsiore tecti, 5–9-flori ; bracteae circa 6 mm. longae et 3.5 mm. latae, apice rotundatae vel fere truncatae, erosae, summo apice caudato-acuminatae, brunneae, ciliolatae, dorso puberulae ; pedicelli infructescentes usque ad 2 cm. longi, indumento ei pedunculi simili tecti. Calyx viridis, utrinque puberulus, 11 mm. longus, lobis 5 mm. longis et 4 mm. latis ciliolatis 3–5 nerviis nervis rectis vel subrectis apice haud anastomosantibus. Corolla ignota. Ovarium 2 mm. altum, stylo brevi stigmate grandi capitato incluso 4.5 mm. longo.

Plateau de Tse-tchou-pa, 2500 m., Mai, fl. bleues, E. E. Maire (Herb. Edin.).

Primula limnoica, Craib (Denticulata) ab affini *P. denticulata*, Wall., foliis tenuioribus pilosulis distinguenda.

Radices sat numerosae, crassae. Folia sub anthesin vix matura, in rosulam suberectam basi squamis exterioribus brunneis induratis interioribus elongatis stramineis brunneo-venosis ad 3 cm. longis cinctam disposita, oblanceolata vel saepius oblongo-oblanceolata, apice rotundata vel obtuso-rotundata, costa paululo excurrente apiculata, basi in petiolum angustata, ad 7.5 cm. longa et 2 cm. lata, chartaceo-membranacea vel membranacea, pagina inferiore pilis mediocribus transverse septatis albis et brevibus capitatis farini-potentibus instructa, superiore iuventute pilosula, cito plus minusve glabrescentia, nervis lateralibus utrinque numerosis pagina utraque conspicuis, margine hydathodo-denticulata, ciliolata, petiolo plus minusve distincto alato ad 3 cm. longo suffulta. Pedunculus solitarius, 15–30 cm. altus, apice luteo-farinosus ; bracteae exteriores parvae, anguste deltoideae, apice longius attenuatae, pedicellos exteriores subaequantes vel iis usque dimidio longiores ; pedicelli exteriores circa 2 mm. longi. Calyx viridis vel saepissime saltem lobis cito purpurascens, 7 mm. longus, lobis 4.5 mm. longis linearibus apice obtusis margine sat dense ciliolatis. Corollae tubus in flore longistylo 11 mm. longus, lobi 6 mm. longi, vix ad medium bilobati, lobulis apice rotundatis, oculo circa 1 mm. lato. Stamina in calyce bene inclusa, antheris 1.75 mm. longis, loculis basi acuminatis. Stylus stigmate subcylindrico circa 1.25 mm. longo incluso 6 mm. longus, in corollae tubo bene inclusus ; ovarium circa 2 mm. altum. Capsula straminea, calyci subaequialta.

Upper Burma. Taping Valley. Lat. 24° 30′ N. Alt. 3500 ft. Plant of 6–15 inches. Flowers lavender-blue. Boggy situations by streams. G. Forrest, 13643. Fl. et Fr. April 1917.

Hpimaw Hill. 7000–9000 ft. Abundant over all the brackened slopes, from the base of Hpimaw hill to 9000 ft. Already passing into seed on 10th April, it still, on some banks, made drifts as densely blue as scabious on a Yorkshire fell-side in August. No scent, or very little. Completely efarinose except at the umbel. R. G. Farrer, 823. Fl., 11th April 1919.

The plants forwarded by Farrer contain short-styled flowers. These were wanting at the time that the description was drawn up from the Taping plant. In the short-styled flower the style is completely included in the calyx and the stamens are completely exserted.

Primula macropoda, Craib (Petiolaris).

Rhizoma crassum, lignosum, radices numerosas fibrosas emittens. Folia omnia basalia, elliptica vel oblongo-elliptica, apice rotundata, saepe late retusa, basi cuneata breviterve acuminata, usque ad 8.5 cm. longa et 5 cm. lata rigide chartacea, supra costa nervisque pallescentibus exceptis viridia, costa basem versus pilis paucis longis transverse septatis ornata, subtus pallidiora, ad costam nervosque laterales pilosa, nervulis pubescentia puberulave, praetereaque pagina utraque pilis brevibus inconspicuis capitatis farini-potentibus sparse instructa, nervis lateralibus utrinque 8–10 supra conspicuis subtus cum costa prominentibus, nervulis rete laxum subtus prominulum vel fere prominens formantibus, margine saepe anguste recurva, hydathodo-denticulata sed haud rarius imam basem versus pauci-lobulata, breviter ciliata; petioli ad 9 cm. longi, apice lamina decurrente anguste alati, pilis longis transverse septatis tecti praetereaque pilis brevibus inconspicuis capitatis subsparse instructi. Pedunculi communes solitarii, infructescentes circa 17 cm. alti, indumento ei petiolorum simili sed nisi summo apice conspicue sparsiore tecti, virides, circa 7-flori; bracteae plus minusve lanceolatae, circa 7 mm. longae, brunneae vel exteriores medio virides et marginem versus brunneae, ciliolatae, dorso medio sparsim breviter pilosae; pedicelli 15–22 mm. longi, superne incrassati, recti, sparse breviter pilosi et pilis brevibus farini-potentibus inconspicuis instructi. Calycis infructescentis viridis tubus circa 7 mm. longus, indumento ei pedicellorum simili dorso tectus, lobi circa 5.5 mm. longi et 3.5 mm. lati, ciliolati, 5-nervii, nervis rectis vel subrectis apice haud anastomosantibus. Corolla ignota. Capsula in calycis tubo inclusa, seminibus angulatis reticulatis.

Szechwan, Pratt, 346, Henry, 8860 (Herb. Kew).

Primula polia, Craib (Petiolaris).

Rhizoma crassum, radices numerosas fibrosas emittens; squamae basales membranaceae, brunneae, pilis brevibus albis vix conspicuis farini-potentibus subsparse tectae, ad 17 mm. longae. Folia omnia basalia, saepissime elliptica vel obovato-elliptica, rarius oblongo-elliptica, apice rotundata, haud rarius retusa, basi rotundata et in petiolum subacuminatim angustata vel in petiolum cuneatim angustata, usque ad 12 cm. longa et 8.5 cm. lata, coriacea vel subcoriacea, pagina superiore ad costae partem trientem inferiorem pilis sat longis transverse septatis plus minusve persistentibus tecta et aliter pilis brevibus albis capitatis farini-potentibus sparse instructa, inferiore pallidiora, pilis brevibus farini-potentibus iis paginae superioris similibus sat dense tecta praetereaque ad costam nervos nervulosque pilis longiusculis sat crassis transverse septatis saepissime minutius capitatis dense instructa, nervis lateralibus utrinque 10–12 obliquis subtus prominentibus, costa supra lata pallescente subtus valde prominente, nervulis rete perfectum subtus prominens supra cum nervis lateralibus impressum formantibus, margine demum anguste recurva, hydathodo-denticulata, ciliata, petiolo 2–4 cm. longo superne lamina decurrente angustius alato subdense piloso et pilis brevibus farini-potentibus puberulo suffulta. Pedunculi communes solitarii vel bini, 10–12 cm. alti, pilis elongatis transverse septatis pilosi et pilis brevibus farini-potentibus sparse puberuli, 2–10-flori; bracteae superne saepissime longius attenuatae, basi subitius ampliatae, brunneae, rigide membranaceae, ciliolatae et dorso sparsissime pilosae, circa 6 mm. longae; pedicelli 5–15 mm. longi, indumento ei pedunculi simili sed apice densius tecti. Calyx viridis, extra indumento simili sed sparsiore tectus, 8.5–9 mm. longus, ad medium lobatus, lobis 3–3.5 mm. latis ciliolatis 5-nerviis nervis rectis subrectisve apice haud anastomosantibus. Floris longistyli corollae tubus 10 mm. longus, apice conspicue annulatus, limbi disco 2.5 mm. lato, lobis 10 mm. longis 12 mm. latis apice ad 2.5 mm. bilobulatis, limbo cum tubi apice pilis paucis crassis transverse septatis instructo. Stamina floris longistyli in calyce inclusa, filamentis circa 5 mm. supra tubi basem insertis, floris brevistyli circa 8.5 mm. supra tubi basem insertis; antherae oblongae, fere 2 mm. longae; filamenta circa 0.75 mm. longa, inferne conspicue dilatata. Ovarium 2 mm. altum; stylus longus 10 mm. longus, brevis calycis tubo subaequialtus, stigmate capitato circa 0.75 mm. longo.

Sous bois-rochers de Ou-tchai, 2000 m., Avril, fl. violettes, E. E. Maire (Herb. Edin.). Forêts de bambous de Lo-han-lin, 2400 m., Mai, fl. bleues, E. E. Maire (Herb. Edin.). Collines boisées de Ou-tchai, 2000 m., flrs. roses, E. E. Maire (Herb. Edin.).

1797 **Primula praticola,** Craib (Petiolaris), species nova ab affini *P. taliense,* G. Forrest, floribus maioribus inter alia distinguenda.

Herba nana, squamis basalibus sub anthesin fere omnino delapsis. Folia sub anthesin erecta vel erecto-patentia, pauca vel satis numerosa et subdense aggregata, apice rotundata, spatulata et basi in petiolum cuneatim angustata ovatave et basi latissime cuneata vel fere truncata, usque ad 3 cm. longa et 1.5 cm. lata, membranacea, viridia, pagina utraque pilis flaccidis albis transverse septatis laxe tecta, nervis lateralibus utrinque 5 patentibus pagina utraque obscuris vel inferiore subconspicuis, margine crassius dentata vel duplicato-dentata, dentibus hydathodo-apiculatis, ciliata, petiolo vix distincto vel alato ad 2 cm. longo pilis iis paginae similibus tecto suffulta. Pedunculus communis solitarius, brevis vel foliis fere aequialtus, cum pedicellis pilis albis flaccidis transverse septatis tectus, 1–5-florus; bracteae elongato-lanceolatae, virides, albo-pilosae, circa 5 mm. longae; pedicelli 10–15 mm. longi. Calyx viridis, campanulatus, 6.5 mm. longus, dorso subsparse albo-pilosus, lobis ovatis obtusiusculis vel interdum obtusiuscule acuminatis 2.5 mm. longis 2 mm. latis ciliatis integris vel pauci-dentatis. Corolla extra sparse albo-pilosa; tubus exannulatus, in flore longistylo 10 mm. longus in brevistylo 12 mm. longus; limbus 1.3–1.4 cm. latus, disco 2.5–3 mm. lato; lobi late obovato-cuneati, 8 mm. longi, circa 8 mm. lati, apice 3-dentati, dentibus medianis deltoideis circa 1.75 mm. longis obtusis, lateralibus latere interiore rectis exteriore rotundatis et undulatis. Antherae vix 1.75 mm. longae, filamentis circa 0.3 mm. longis antheris omnino vel vix obtectis in flore longistylo circa 4 mm. supra corollae basem insertis suffultae, in flore longistylo in calyce inclusae. Ovarium circa 1 mm. altum; stylus cum stigmate globoso longus 8.75 mm. longus, brevis calyce brevior, 4 mm. longus.—*P. talicnsis*, Craib in Notes Roy. Bot. Gard. Edin., vi, p. 270, p.p. *non* G. Forrest.

Yunnan. Shweli-Salwin divide, 11,000 ft. Lat. 25° 30′ N. Plant of 2–3 inches. Flowers purplish-rose. Open moist pasture. G. Forrest, 15,707. Fl. July 1917.

Shweli-Salwin divide, 10,000 ft. Lat. 25° 30′ N. Plant of 2–3 inches. Flowers purplish-blue. Open stony moist pasture. G. Forrest, 11,942. Fl. April 1913.

Primula Davidii and its Allies.

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At the time of Pax's elaboration of the genus Primula in Engler's Pflanzenreich only two species of this group were known, viz. *P. Davidii* and *P. ovalifolia*, both described by Franchet from David's Moupin plants. These species were placed by Pax in his section *Bullatae*, although Franchet had already correctly indicated their affinity to *P. petiolaris*. The consequent lack of uniformity in the section as understood by Pax has already been commented on by Professor Balfour * in his account of the Primulas of the *Bullatae* section. Both from habit and from fruit characters *P. Davidii* and its allies must be placed as a rather well-defined group of the *Petiolaris* section. The members of the *Petiolaris* section would then have in common the "characteristic enlargement of the scape and pedicels in fruit ripening, and for the fruit itself a discoid operculate capsule occupied by a broad convex placenta upon which the seeds lie." †

The members of the *Petiolaris* section fall into several more or less well-defined groups: (1) the *petiolaris* group, as typified by *P. petiolaris*, *P. sessilis*, etc.; (2) the *sonchifolia* group, as typified by *P. sonchifolia*, *P. Whitei*, etc.; (3) the *Davidii* group, as typified by *P. Davidii*, *P. ovalifolia*, etc.; and (4) the *Griffithii* group, as typified by *P. Griffithii*, *P. Roylei*, etc.

Of the first two groups an account has already appeared in this publication.‡ Specimens of the *Griffithii* group have not yet been fully examined. In *P. hylophila* we have a transitional form between the *Davidii* group and such species as *P. odontocalyx* and *P. moupinensis* of the *petiolaris-sonchifolia* group. In the present group we find the thick, erect, closely adpressed rosette scales of *P. sonchifolia* replaced by brown lax, paleaceous scales. Except in *P. Esquirolii* a well-developed

* Balf. f. in Trans. Bot. Soc. Edin., xxvi, p. 188 (1913).
† Balf. f. in Notes Roy. Bot. Gard. Edin., ix, p. 174 (1916).
‡ Craib in Notes Roy. Bot. Gard. Edin., vi, p. 257 (1917).

scape is always present—in many members of the *petiolaris* group the scape is so reduced as almost to justify its being regarded as undeveloped. Farini-potential hairs are present on all the species, but the development of farina is so scanty that one may apply the term efarinose to the group. One solitary fruiting specimen shows a candelabroid tendency in the peduncle bearing a lateral verticil and a terminal umbel of flowers. This is the only case so far noted of superposed umbels in the whole *Petiolaris* section.

None of the species are at present in cultivation. Wilson succeeded in introducing plants which flowered and which were figured as *P. ovalifolia*,* Franch. This plant is evidently not the true *P. ovalifolia* but is apparently *P. aequipila*, Craib. From Forrest's seed plants of *P. coerulea* were raised,† but the species is no longer in cultivation, the plants having died before flowering.

Up to the present the following species are known :—

P. Davidii, Franchet in Bull. Soc. Bot. Fr., vol. xxxiii (1886), p. 66, et in Nuov. Arch. Mus. Par., Ser. 2, vol. x (1887), p. 56, t. 14, fig. A—collected by David in Moupin.

P. ovalifolia, Franchet ll. cc., pp. 67 et 57—collected by David in Moupin.

P. Esquirolii, Petitm. in Bull. Soc. Sci. Nancy, Sér. 3, vol. viii (1907), p. 16, et in Fedde, Rep. Nov. Sp., vol. ix, p. 240—collected in Kweichow by Esquirol and Martin.

P. coerulea, G. Forrest in Notes Roy. Bot. Gard. Edin., vol. iv (1908), p. 221, t. xxxiv—collected by G. Forrest in Yunnan.

P. hylophila, Balf. f. et Farrer in Notes Roy. Bot. Gard. Edin., vol. ix (1916), p. 173—collected by Farrer and Purdom in Kansu.

Examination of the specimens preserved in the Royal Botanic Gardens of Edinburgh and Kew has necessitated the establishment of six more species :—

P. aequipila, Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 169.

P. epilosa, Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 171.

P. fagosa, Balf. f. et Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 172.

* Gard. Chron., Ser. 3, xxxviii, p. 62 (1905), supplem. illustr.

† Balf. f. in Journ. Roy. Hort. Soc., xxxix, p. 147 (1913).

P. leptophylla, Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 174.
P. macropoda, Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 176.
P. polia, Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 177.

The complete absence of flowers in some cases and restrictions imposed through lack of material for dissection in others have compelled me to fall back on leaf-characters for the construction of a key.

KEY TO THE SPECIES.

Flowers single or shortly umbellate . . . . . 1. *Esquirolii.*
Flowers always conspicuously arranged in umbels.
Lower surface of leaf with farini-potent hairs only.
Leaves erose-denticulate, thin, non-reticulate, lateral nerves up to 12 pair ; corolla limb about 2.5 cm. diameter . . . . . 2. *hylophila.*
Leaves crenulate, chartaceous, reticulation elevated on lower surface, lateral nerves up to 16 pair ; corolla limb about 3.4 cm. diameter . . . . . 3. *epilosa.*
Lower surface of leaf with long multicellular hairs in addition to the short farini-potent ones.
Leaf-margin sharply erose-denticulate, not recurved ; leaves non-reticulate ; corolla limb about 3 cm. diameter . . . . . 4. *Davidii.*
Leaf-margin with short hydathodal teeth, crenulate or subcrenulate, usually recurved though often very narrowly so ; reticulation nearly always elevated on lower surface of leaf.
Longer multicellular hairs more or less evenly distributed on lower leaf-surface, those occurring between the nervules but slightly shorter than those on the nervules . . . . . 5. *aequipila.*
Longer multicellular hairs on lower leaf-surface confined definitely to midrib and nerves.
Leaves sessile or with a short, broadly winged, scarcely differentiated petiole . . . . . 6. *fagosa.*
Leaves distinctly petioled.
Leaves membranous, with inconspicuous nervules which do not form a prominent reticulation, midrib without long hairs on upper surface unless towards the very base . . . . . 7. *leptophylla.*
Leaves thicker, nervules forming a more or less complete, close or open reticulation prominent on the lower surface ; midrib with conspicuous long hairs on the upper surface, the hairs nearly always persistent.
Petiole at least as long as the lamina ; farini-potent hairs on the lower surface few and scarcely conspicuous with a pocket-lens . . 8. *macropoda.*
Petiole shorter than the lamina.
Long-styled corolla with a conspicuous annulus . . . . . 9. *polia.*

Corolla exannulate.
Corolla tube above the decidedly apiculate anthers with long conspicuous multicellular hairs . . . . . 10. *coerulea*.
Corolla tube of long-styled flower without conspicuous hairs; anthers blunt or obscurely apiculate . . . . . 11. *ovalifolia*.

ENUMERATION OF THE SPECIES, WITH SYNONYMY AND DISTRIBUTION.

1. **P. Esquirolii,** Petitm. in Bull. Soc. Sci. Nancy, Sér. 3, vol. viii (1907), p. 16, et in Fedde, Rep. Nov. Sp., vol. ix, p. 240; Balf. f. in Journ. Roy. Hort. Soc., xxxix (1913), pp. 133, 147; Dunn in Journ. Linn. Soc., vol. xxxix (1911), p. 480.

Kweichow, Gan-pin, 1350 m., Esquirol et Martin (Herb. Edin. !). Gan-pin et Gan-chouen, Cavalerie, 3804 (Herb. Edin. !). Environs de Gan-pin, Martin et Bodinier, 2068 (Herb. Edin. !).

2. **P. hylophila,** Balf. f. et Farrer in Notes Roy. Bot. Gard., Edin., vol. ix (1916), p. 173.

Kansu, from Chago to Thunder-crown above Siku, 7000–9000 ft. Very abundant in all the alpine forests in rich loam and on rotten trunks, not in *dense* shade. Early April–May. Farrer et Purdom, F. 38, P No. 1 (Herb. Edin. !).

3. **P. epilosa,** Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 171.

W. China, wet rocks, 6000 ft. Flrs. purple. Wilson, 4048 (Herb. Kew !).

4. **P. Davidii,** Franchet in Bull. Soc. Bot. Fr., vol. xxxiii (1886), p. 66, et in Nuov. Arch. Mus. Par., Ser. 2, vol. x (1887), p. 56, t. 14, fig. A; Pax in Engler Bot. Jahrb., vol. x (1889), p. 176; Diels in Engler Bot. Jahrb., vol. xxix (1900), p. 521; Pax in Engler Pflanzenr. Primul. (1905), p. 43; Forbes et Hemsl. in Journ. Linn. Soc., vol. xxxvi (1905), p. 504; Balf. f. in Journ. Roy. Hort. Soc., vol. xxxix (1913), pp. 132, 146.

Moupin, David, March 1869 (Herb. Kew !).

5. **P. aequipila,** Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 169.

P. ovalifolia, Forbes et Hemsl. in Journ. Linn. Soc., vol. xxvi (1889), p. 41, quoad plantas Henryanas tantum; Diels in Engler Bot. Jahrb., vol. xxix (1900), p. 521,

quoad plantam Henryanam ; Kew Bull., 1904, App. iii, p. 82 ; Duthie in Gard. Chron., Ser. 3, vol. xxxviii (1905), p. 62, supplem. illustr. ; Pax in Engler Pflanzenr. Primul. (1905), p. 43, quoad plantas hupehanas citatas ; Balf. f. in Journ. Roy. Hort. Soc., vol. xxxix (1913), p. 146, quoad plantam Wilsonianam, *vix* Franchet.

Hupeh. Changyang, wet places, 5600 ft., flrs. purple, Wilson, 52 (Herb. Edin.! Kew!), Wilson, 52A (Herb. Kew!) ; Changyang Hsien, woodlands, 4000–6000 ft., flrs. blue-purple, Wilson, 3140 (Herb. Edin.!) ; Patung and Changyang, Henry, 5286A (Herb. Kew!) ; Patung, Henry, 707, 1456, 3731 (Herb. Kew!) ; Patung, 6000 ft., flrs. purple, Henry, 5286 (Herb. Kew!).

Szechwan, N. Wushan, 6000–8000 ft., Henry, 7148 (Herb. Kew!).

This species, if all the plants cited are correctly referred to it, is very variable, both in leaf shape and in its calycine characters. The plants collected in Hupeh by Henry are especially variable in these directions.

The plant introduced by Wilson and figured as *P. ovalifolia* I have little hesitation in referring to this species. It did not persist long in cultivation.

6. **P. fagosa,** Balf. f. et Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 172.

Szechwan, Tchen-kéow-tin, Farges, 119 (Herb. Edin.! Kew!).

7. **P. leptophylla,** Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 174.

Plateau de Tse-tchou-pa, 2500 m., flrs. bleues, E. E. Maire (Herb. Edin.!).

8. **P. macropoda,** Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 176.

P. ovalifolia, Duthie in Gard. Chron., Ser. 3, vol. xxxviii (1905), p. 62, quoad plantam Prattianam, *vix* Franchet.

Szechwan, Pratt, 346, Henry, 8860 (Herb. Kew!).

9. **P. polia,** Craib in Notes Roy. Bot. Gard. Edin., vol. xi (1919), p. 177.

Forêts de bambous de Lo-han-lin, 2400 m., flrs. bleues, E. E. Maire (Herb. Edin.!). Sous bois-rochers de Ou-tchai, 2000 m., flrs. violettes, E. E. Maire (Herb. Edin.!). Collines boisées de Ou-tchai, 2000 m., flrs. roses, E. E. Maire (Herb. Edin.!).

10. **P. coerulea,** G. Forrest in Notes Roy. Bot. Gard. Edin., vol. iv (1908), p. 221, t. xxxiv ; Dunn in Journ. Linn. Soc., vol. xxxix (1911), p. 480 ; Balf. f. in Journ. Roy. Hort. Soc., vol. xxxix (1913), pp. 132, 147.

Yunnan. Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11,000–12,000 ft. Plant of 2–3 ins. Open exposed situations on rocks in side valleys. Flowers rich purplish-blue, eye and tube yellowish-green. G. Forrest, 1814. Ibid. G. Forrest, 6803.

11. **P. ovalifolia,** Franchet in Bull. Soc. Bot. Fr., vol. xxxiii (1886), p. 67, et in Nuov. Arch. Mus. Par., Ser. 2, vol. x (1887), p. 57 ; Pax in Engler Bot. Jahrb., vol. x (1889), p. 176 ; Forbes et Hemsl. in Journ. Linn. Soc., vol. xxvi p. 41, quoad *distr.* tantum ; Diels in Engler Bot. Jahrb., vol. xxix (1900), p. 521, quoad plantam Davidianam ; Pax in Engler Pflanzenr. Primul. (1905), p. 43, quoad plantam Davidianam tantum ; Balf. f. in Journ. Roy. Hort. Soc., vol. xxxix (1913), pp. 136 et 146, quoad plantam moupinensem.

Moupin, David, March 1869 (Herb. Kew !).

In conclusion I wish to express my indebtedness to the Director of the Royal Gardens, Kew, for kindly placing the Kew herbarium material at my disposal, as also to Professor Balfour for free access to the herbarium specimens preserved here.

Polygala furcata, Royle, and its Allies.

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ALTHOUGH Hasskarl * had pointed out that the name *Polygala triphylla* was already occupied for a S. African plant,† Bennett ‡ in elaborating the species of Polygala from India retained Don's name *P. triphylla* for an Indian plant. Unfortunately Hasskarl in suggesting the new specific name *Hamiltonii* for Don's species followed Royle, and described under that name a totally different plant from Don's *P. triphylla*. Succeeding authors have more or less perpetuated Hasskarl's mistake.

Hamilton named a Narainhetty plant collected by himself *Polygala triphylla*, but did not publish the species. Don § published the species later under Hamilton's manuscript name, and quoted a Wallichian plant in addition to that collected by Hamilton. Presumably the Wallichian plant quoted is the one which Wallich quoted in his catalogue as *P. glaucescens*. For present purposes we may reduce the main features claimed by Don for his species to: stem 2–3 inches high, trichotomous at the apex, flowers small, yellow.

Fourteen years later Royle ‖ enumerated and figured two species of Polygala: *P. triphylla* and *P. furcata*. A glance at Royle's figure of *P. triphylla* shows that it disagrees with Don's description, in that the flowers are not yellow and that the stem branches from the base. Royle's figure of his *P. furcata* agrees, however, with the main features of Don's species as quoted above, viz. the stem branches only at the apex and the flowers are yellow.

In 1863 Hasskarl * described three Indian species under the genus *Semeiocardium*: *S. Hamiltonii*, *S. hyalinum*, and *S. glaucescens*. According to his synonymy Hasskarl intended

* Hasskarl in Miq. Ann. Mus. Bot. Lugd. Bat., i, p. 151 (1863).
† *Polygala triphylla*, Burm. f.
‡ Bennett in Hook. f., Fl. Brit. Ind., i, p. 201 (1872).
§ D. Don, Prodr. Fl. Nepal., p. 200 (1825).
‖ Royle, Ill., t. 19, B. et D. (1839).

[Notes, R.B.G., Edin., No. LIV, October 1919.]

his *S. Hamiltonii* to be the *P. triphylla*, Don *non* Burm. f., but in his description he says flowers " albidi apicem versus rubentes (flavi ex D. Don l.c.)," *i.e.* his *S. Hamiltonii* agrees in the colour of the flowers with Royle's *P. triphylla* and is not Don's plant. *S. glaucescens* is based on the Wallichian *P. glaucescens* from Nepaul, which is, as noted above, probably the true *P. triphylla*, D. Don. In the case of his *S. hyalinum* Hasskarl again derived his specific name from a Wallichian plant (*P. hyalina* from Burma), but he quotes in addition a plant collected by Zippelius from New Guinea.

In 1872 * Kurz published a new species of this group from Parish's Tenasserim collections under the name *P. cardiocarpa*.

In the same year Bennett's † elaboration of the Indian species was published, so that Kurz's species is not included. Bennett's treatment of *P. triphylla*, D. Don, follows on the whole that of Royle and Hasskarl. Excluding his quotations of synonyms, we may say that his var. 1 *Triphylla proper* is for the most part Royle's and not Don's *P. triphylla*, and that his var. 2 *Glaucescens* agrees for the most part with *P. furcata*, Royle, *i.e.* with *P. triphylla*, D. Don.

Kurz in his later contributions to the flora of Burma enumerates two species, viz. his own *P. cardiocarpa* and *P. glaucescens*. While he quotes *P. furcata*, Royle, as a synonym of the latter, he makes no mention of *P. triphylla*.

From this date onwards until a few years ago the nomenclature published in the Flora of British India was more or less adhered to, *i.e.* Don's original description notwithstanding, the true *P. triphylla*, D. Don, was regarded as the plant with red or red-tipped flowers, and *P. triphylla* var. *glaucescens* as the yellow-flowered form. The comparatively recent monograph by Chodat practically follows accepted usage.

The unsatisfactory condition of the nomenclature was fully realised when I was working with the late Mr J. H. Lace on his Burmese collections. Our work then resulted in the publication of two new species—*P. palustris* and *P. pellucida*—which, however, are but remotely connected with this group.

Further work had, however, to be suspended until we had examined authentic material of *P. cardiocarpa*, Kurz, of which species there was no material in this country. I am indebted to Major A. T. Gage, Superintendent of the Royal Botanic Gardens, Calcutta, for an opportunity of examining Kurz's original plant. Examination of Kurz's plant enabled the work to be completed by the publication of two more new species—*P. Lacei* and *P. umbonata*.

* Kurz in Journ. As. Soc. Beng., 1872, p. 293.

† Bennett in Hook f., Fl. Brit. India, i, p. 200 (1872).

KEY TO THE SPECIES.

Flowers purple or pink or white and pink-tipped : seed distinctly pubescent but not tubercled . . . . . 1. *P. Tatarinowii.*

Flowers yellow : seed glabrous or pubescent, distinctly tubercled.

Seed glabrous.

Seed (without aril) 1.25 mm. long with comparatively few large tubercles : capsule 3.5 mm. long, wing less than one-fourth breadth of capsule . . . . . 2. *P. Lacei.*

Seed (without aril) 0.75 mm. long with many small tubercles : capsule (excluding wing) 1.5 mm. long, wing one half-breadth of capsule . . . . . 3. *P. cardiocarpa.*

Seed pubescent.

Seed with large black shining development at chalaza equal in length to about one-half the seed . . . . . 4. *P. umbonata.*

Seed with scarcely prominent black shining umbo at chalaza or with a pale-coloured production.

Capsule suborbicular . . . . . 5. *P. furcata.*

Capsule oblong . . . . . 6. *P. hyalina.*

SYNONYMY AND DISTRIBUTION OF THE SPECIES.

1. **P. Tatarinowii,** Regel in Bull. Soc. Nat. Mosc., xxxiv, pt. ii, p. 523 (1861) ; Forbes et Hemsl. in Journ. Linn. Soc., xxiii, p. 62.

P. triphylla, Royle, Ill., t. 19D *non* D. Don *nec* Burm. f. ; Forbes et Hemsl., l.c., pro parte.

P. triphylla, var. 1 *Triphylla proper,* Benn. in Hook. f., Fl. Brit. Ind., i, p. 201, excl. syn. *P. hyalina.*

Semeiocardium Hamiltonii, Hassk. in Miq. Ann. Mus. Bot. Lugd. Bat., i, p. 151, quoad descr. sed syn. *Polygala triphylla* excl.

China. Pekin, Carles, 23 ! Shantung, Clemens, 1427 ! Yunnan, Forrest, 901 ! Maire, 2688 ! 732 ! Henry, 9343 ! Delavay, 259 ! Delavay ! Hupeh, Wilson, 2533 ! Henry, 2486 !

N.W. India, Stewart ! Reid ! Simla, Lady Dalhousie ! Watt, 9377 ! Crookshank ! Bashahr, Lace, 1058 ! Chamba, Lace, 1753 ! 1846 !

2. **P. Lacei,** Craib in Kew Bull., 1916, p. 260.

Siam. Doi Chieng Dao, 5500–5900 ft., on rocks, Kerr, 2889 (Herb. Kew !).

Upper Burma. Ruby Mines, Lace (Herb. Edin. !).

Yunnan. Puerh cliffs, 4500 ft., Henry, 9303A (Herb. Edin. !).

3. **P. cardiocarpa,** Kurz in Journ. As. Soc. Beng., 1872, p. 293.
Lower Burma. Tenasserim, Parish, 307 (Herb. Calc. !).

4. **P. umbonata,** Craib in Kew Bull., 1916, p. 260.
Siam. Prê, Hue Tuam, Vanpruk, 328 (Herb. Kew !).
Upper Burma, Lace, 5477 (Herb. Edin. !).

5. **P. furcata,** Royle, Ill., t. 19B (1839).
P. triphylla, Ham. ex D. Don Prodr. Fl. Nepal., p. 200 (1825), non Burm. f.
P. glaucescens, Wall. Cat.—nomen tantum.
P. triphylla, var. 2 *glaucescens*, Benn. in Hook. f., Fl. Brit. Ind., i, p. 201, syn. *Semeiocardium hyalinum* excl.
Semeiocardium glaucescens, Hassk. in Miq. Ann. Mus. Bot. Lugd. Bat., i, p. 151 (1863).
N.W. India. Dry hillside above Narainbagur, c. 5000 ft., Reid (Herb. Edin. !).
Upper Burma. N. Shan States, Gokteik Gorge, 2100 ft., Lace, 4143 (Herb. Edin. !).

6. **P. hyalina,** Wall. ex Hassk. in Miq. Ann. Mus. Bot. Lugd. Bat., i, p. 151 (1863), in syn.
P. triphylla, var. 1 *Triphylla proper*, Benn. in Hook. f., Fl. Brit. Ind., i, p. 201, quoad syn. *P. hyalina*.
P. triphylla, var. *glaucescens*, Benn. in Hook. f., Fl. Brit. Ind., i, p. 201, quoad syn. *Semeiocardium hyalinum*.
Siam. Doi Sutep, Kerr, 777, 886 (Herb. Kew !). Wang Djao, Hosseus, 55 (Herb. Edin. ! Kew !).
Burma, Wallich (Herb. Kew !).

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A New Chinese Pseudotsuga.

BY

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in the University of Edinburgh.

With Plates CLX-CLXI.

1509 **Pseudotsuga Forrestii,** Craib, sp. nov., *P. sinensi,* Dode, similis sed foliis longioribus, strobilis maioribus, bracteis conspicue maioribus distinguenda.

Arbor 60–80-pedalis (ex Forrest) ; ramuli hornotini brunnei, pilis brevibus rigidis saepe reflexis conspersi puberulive tantum, annotini pallescentes, demum plus minusve grisei ; alabastra brunnea, perulis saltem interioribus ciliatis, paucis per annos 1–2 persistentibus. Folia spiraliter inserta, pectinatim disposita, apice rotundata, bilobulata, lobulis saepissime inaequalibus, usque ad 4.5 cm. longa, circa 2 mm. lata, costa supra conspicue impressa subtus prominente, margine sicco plus minusve recurva, subtus stomatifera, fasciebus sicco griseis vix conspicuis. Strobili distincte pedunculati, circa 5.7 cm. longi et 3.7 cm. lati, haud rarius valde resinosi, squamis bracteisque iis *P. sinensis* subsimilibus nisi squamis brunneis haud pallide brunneis, bracteis maioribus longius exsertis. Semina cum alis 1.3–1.7 cm. longa, subtus pallida, pallide-brunneo-lineolato-maculata, ala ima basi cucullata, ala facie superiore prope seminis apicem paucipilosa.

Yunnan. Mekong Valley. Lat. 27° 40′ N. Alt. 10,000 ft. Tree of 60–80 ft. Mixed forests. G. Forrest. No. 13,003. Fr. Aug. 1914 et No. 13,545. Fr. Oct. 1914.

Young plants raised from seed of Forrest, 13,003, are in cultivation at the Royal Botanic Garden, Edinburgh. Twigs of a plant of unknown origin sent for identification by Sir E. Loder apparently also belong to this species.

Probably referable to *P. Forrestii* is a herbarium sheet of Ward's N.W. Yunnan and E. Thibet plants: Ward, 461, "Very big tree up to 80 ft., on precipices and rocky places with *Pinus*, 10,000 ft. Also at Doker-la in mixed forest."

P. Forrestii can be distinguished from *P. sinensis* by trans-

[Notes, R.B.G., Edin., No. LV, November 1919.]
Wt. 11496/145—375—3/20—N. & Co., Ltd. Gp. 10.

verse sections of the leaf. In the former hypodermis is developed only in the median plane of the leaf and very sparsely at the margins. Occasionally one or two solitary cells may be found along the upper surface between the margin and the midrib. In *P. sinensis*, on the other hand, there is a well-marked continuous or almost continuous hypodermis. And again, the epidermal cells of *P. Forrestii* tend to be decidedly deeper than broad, whereas those of *P. sinensis* are almost as broad as deep.

P. sinensis and *P. Forrestii* are two closely allied species which form a geographically and systematically distinct subgenus. A first examination of the cone of either species recalls from the consistency of the scales the genus *Keteleeria*, the bracts alone reminding one of *Pseudotsuga*. The leaves and buds agree well with *Pseudotsuga*. Leaf-anatomy also supports their subgeneric rank. In the leaves of both species we find rayed idioblasts and infoldings of the cell-wall of the spongy tissue. In both these characters they differ from the true *Pseudotsuga*. The presence of rayed idioblasts is admittedly not of generic importance, *e.g.* some species of *Abies* develop them but in many more they are absent. But the presence of the infoldings of the cell-wall has been regarded as of generic rank. The infoldings are not so uniform as in *Pinus*, and in the material examined I failed to detect them in the palisade tissue. But they do form quite a marked feature of the spongy tissue of the leaf of *P. sinensis* and of *P. Forrestii*.

Sections of the oldest available branches on the herbarium specimens of Forrest, 13,003, show the distinctive anatomical features associated with the wood of the genus *Pseudotsuga*.

Of the other two Asiatic species of the genus sufficient material is not yet available. Of *P. japonica* there are several young plants in cultivation here, and Sir E. Loder has also sent a fragment of a cultivated plant. Leaf-sections from both sources show the same anatomical structure as found in *P. Douglasii*, *i.e.* leaf-sections made from young plants show no rayed idioblasts and no infoldings of the cell-wall. Of *P. Wilsoniana** from Formosa I have seen no specimens.

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CLXI. Pseudotsuga sinensis, Dode.

* Hayata in Icon. Plant. Formos., v (1915), 204, tab. xv.

PSEUDOTSUGA FORRESTII, CRAIB.

PSEUDOTSUGA SINENSIS, DODE.

DIAGNOSES

Specierum novarum

in herbario Horti Regii Botanici Edinburgensis cognitarum.

CCCCI–CCCCL.

The species and varieties described in this series are :—

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4037 **Acanthopale Dalzielii,** W. W. Sm. Sp. nov.

Species affinis *A. oligantho* (Miq.) Clarke a qua foliis superioribus sessilibus subglabris inter alia differt; ob formam pollinis unà cum *Strobilanthe debili,* Hemsl. et *S. radicante,* T. Anders. (in genere suo a cl. Clarke positis) collocanda.

Fruticulus fortasse ad 1 m. altus ramosus ramis gracilibus

flexuosis sparsim et minute pilosulis. Folia superiora tantum visa sessilia vel subsessilia, subaequalia vel valde inaequalia, majora ad 9 cm. longa, ad 4 cm. lata, minora 2–5 cm. longa, 1–2 cm. lata, ovata vel ovato-lanceolata, apice acuminata vel acuta vel rarius obtusa, basi rotundata, margine remotiuscule serrulata, in sicco membranacea, supra atroviridia lineolata glabra, infra pallidiora glabra vel ad nervos circ. 5-jugos sparsissime pilosula. Inflorescentiae terminales et ex axillis superioribus ortae 2–3 cm. longae spiciformes 2–4-florae remotiflorae ; axis sparsim albido-pilosa ; bracteae lineari-lanceolatae foliaceae ; pedicelli obsoleti vel brevissimi. Calyx circ. 1 cm. longus in lobos sublineares ad imum fissus, basi atque ad costulas loborum dense albo-pilosus. Corolla 4.5 cm. longa ; tubus infra cylindricus supra sensim ampliatus, parte cylindrica circ. 1 cm. longa, extra minute pilosulus; lobi rotundati circ. 8 mm. diametro. Stamina perfecta 4, longiora paulo exserta ; pollen echinatum. Fructus deest.

China :—At Thai-yong, a mountain valley, 2000 ft. elevation, 60 miles west from Swatow. July 1901. Dr. J. M. Dalziel. No. 71.

This species has the typical *Strobilanthes* habit, but has echinate pollen. Consequently, with many others noted by Clarke in King and Gamble's Materials for Flora of Malayan Peninsula (1907), 869, it comes under his genus *Acanthopale*. It differs from Lindau's *Pseudostenosiphonium* by the presence of 4 stamens instead of 2. See Clarke in Fl. Trop. Afr., v (1900), 60, 63, under *Distichocalyx* and *Acanthopale*.

4178 **Agapetes megacarpa,** W. W. Sm. Sp. nov.

Species quoad folia *A. parviflorae,* Dunn subsimilis a qua floribus magnis longe distat ; inter species regionis burmanico-chinensis calycis lobis longissimis bene notata, qui eis *A. macrophyllae,* Clarke sunt aequilongi.

Frutex ad 6 m. altus. Rami crassi glabri pallide cinerascentes. Folia sessilia vel petiolo crassissimo tantum 1–2 mm. longo suffulta ; lamina 10–17 cm. longa, 2–4 cm. lata, lanceolata, apice acuta vel sensim et breviter acuminata, basi angusta rotundata, integra, papyracea, utrinque opaco-viridis, glabra, infra paulo pallidior, costa media subtus eminente, nervis lateralibus multis bene reticulatis in sicco subconspicuis. Inflorescentiae (fructiferae tantum visae) axillares fasciculato-corymbosae 2–4-florae ; pedunculus circ. 1 cm. longus crassus ; pedicelli in fructu 2–3 cm. longi, anguste claviformi-incrassati glabri in sicco pallide purpurascentes. Fructus subglobosus circ. 11–12 mm. diametro. Calycis lobi circ. 1 cm. longi, basi 3 mm. lati, lanceolati, acuti, rubido-purpurascentes nervis fere longitudinalibus pererrati.

"China :—Shweli-Salween divide, Yunnan, in open thickets. Lat. 25° 6′ N. Alt. 7000 ft. Shrub of 20 ft. Flowers creamy yellow? Calyces ruddy. April 1917." G. Forrest. No. 13,698.

5904 **Arabis alpina,** Linn., var. **purpurea,** W. W. Sm. Var. nov.

Varietati *rubrocalyci,* Franch. simillima sed floribus saturate purpureo-roseis differt.

"China :—Yunnan, on the Bei-ma Shan. Lat. 28° 12′ N. Alt. 12,000 ft. Plant of 6–15 inches. Flowers deep purple-rose. On open rocks and cliffs. June 1917." G. Forrest. No. 13,977.

3664 **Arenaria barbata,** Franch., var. **hirsutissima,** W. W. Sm. Var. nov.

A typo differt caulibus, foliis utraque facie, pedicellis, calycibus pilis longissimis albis densissime onustis.

"China :—Yunnan; Eastern flank of the Lichiang Range. Lat. 27° 40′ N. Alt. 11,000–12,000 ft. Plant of 6–10 inches. Flowers white or very pale rose. Dry open stony mountain meadows. Aug. 1910." G. Forrest. No. 6299.

3665 **Arenaria euodonta,** W. W. Sm. Sp. nov.

Species affinis *A. quadridentatae,* Williams et *A. roseiflorae,* Sprague sectionis *Odontostemmatis*; ab illa foliis linearibus fere glabris, floribus duplo majoribus est distinguenda; ab hac valde affini foliis linearibus textura gramineis divergit.

Planta perennis ramosa diffusa. Radix elongata fusiformis caudice squamis induto. Caules e basi ramosi, suberecti vel ascendentes, 10–35 cm. alti, pilis articulatis albidis vel nigrescentibus plus minusve dense crispato-pubescentes. Folia 1–2 cm. longa, circ. 1 mm. lata, linearia, apice ipso obtusiuscula, basi paulo dilatata, membranacea punctis elevatis notata, ad margines et ad costam mediam infra plus minusve pilosula. Flores solitarii vel in cymas 3–5-floras dispositi albi vel pallide rosei; pedicelli ad 2.5 cm. longi pilis articulatis nigridis dense induti; bracteae foliis similes sed triplo minores. Sepala circ. 8 mm. longa, 2.5 mm. lata, plus minusve oblonga, ciliata, extra nigrido-pilosula, interiora late scarioso-marginata. Petala circ. 1.5 cm. longa, oblanceolata, apice 2–3-dentata, alba vel pallide rosea. Stamina 10 calycem paulo excedentia filamentis glabris. Ovarium oblongum 3–4 mm. longum stylis duobus circ. 4 mm. longis munitum.

"China :—Yunnan, Kari Pass, Mekong-Yangtze divide. Lat. 27° 40′ N. Alt. 13,000 ft. Matted plant of 9–14 inches. Flowers white. Open situations on and amongst boulders. July 1914." G. Forrest. No. 12,891.

"S. E. Tibet :—On Doker-La, Mekong-Salween divide. Lat. 28° 20′ N. Alt. 12,000 ft. Plant of 4–8 inches. Flowers pale rose-pink. On open stony pasture and screes. Aug. 1917." G. Forrest. No. 14,640.

The nearest relative of this species is *A. roseiflora*, Sprague, a plant of the Mekong-Salween divide. The flowers of the two species are extremely alike. The leaves of Forrest No. 13,225 * and Ward No. 901 are thick and fleshy, and are broader than those of *A. cuodonta*. The leaves of *A. cuodonta* in the dried state are thin and grass-like. The species may be an extreme form of *A. roseiflora*, but in the absence of intermediates I prefer to keep them separate.

3668 **Arenaria inornata,** W. W. Sm. Sp. nov.

Species affinis *A. roseiflorae*, Sprague a qua habitu nano, calyce multo minore, corolla alba inter alia removitur.

Planta perennis nana. Radices numerosae anguste fusiformi-incrassatae ; caudex squamis indutus. Caules 1–3, erecti vel suberecti, 5–6 cm. alti, pilis articulatis albidis vel fulvidis vel tandem nigrescentibus plus minusve dense pubescentes. Folia inferiora squamiformia imbricata cauli adpressa ; superiora in petiolum vix discretum late marginatum dense albo-ciliatum attenuata, 1–1.3 cm. longa, 3–4 mm. lata, lanceolata vel elliptico-lanceolata, apice obtusiuscula vel subacuta, margine ciliata tandem glabrescentia, utrinque glabra vel fere glabra, tenuiter papyracea. Flores solitarii vel in cymas trifloras dispositi albi ; pedicelli ad 1 cm. longi pilis articulatis nigridis dense induti ; bracteae foliis similes. Sepala exteriora circ. 5 mm. longa, 1–1.5 mm. lata, oblongo-lanceolata, obtusa, extra ad basim et ad medium et ad margines dense glanduloso-pilosula, interiora late scarioso-marginata. Petala circ. 1 cm. longa, obovata, apice breviter emarginata et saepius pauci-denticulata. Stamina 10 calycem paulo superantia filamentis glabris ; glandulae ut in sectione *Odontostemmate*. Ovarium 2 mm. longum stylis duobus circ. 4 mm. longis instructum. Fructus deest.

"China :—N.W. Yunnan, on the Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12,000 ft. Plant of 2–3 inches. Flowers white. On boulders and ledges of cliffs. July 1917." G. Forrest. No. 14,444.

3668 **Arenaria napuligera,** Franch., var. **monocephala,** W. W. Sm. Var. nov.

Haec planta a typo differt caule simplice, floribus solitariis, stylis duobus ; inter *A. napuligeram*, Franch. et *A. ionandram*,

* Vid. *A roseiflora*, Sprague in Kew Bull. (1916), 33.

Diels intermedia esse videtur ; ab *A. ionandra* floribus solitariis, calyce pilosulo differt.

"S.E. Tibet :—At Ka-gwr-pw temple, near the Yunnan frontier ; in Alpine turf on precipices. Alt. 15,500 ft. July 1913." F. K. Ward. No. 814.

This appears to be an extreme alpine form of *A. napuligera*, Franch. The presence of two styles instead of three may, however, be a fundamental difference. In his description of *A. ionandra*, Diels * points out that his species is closely related to *A. napuligera*, differing in the glabrous sepals and two styles. Further material from Yunnan tends to bridge the gap between the two species. Thus in Forrest No. 6192 the two species appear on the same sheet, collected together in the Lichiang Range. I find a transition in the hairiness of the calyx and in the number of styles. Specimens with solitary flowers occur in the same gathering.

3610[9] **Arenaria oresbia,** W. W. Sm. Sp. nov.

Species inter himalaicas et chinenses affines bene distincta ; quoad habitum foliaque haud remota ab *A. lichiangensi*, W. W. Sm. a qua pedunculis elongatis foliatis atque floribus multo majoribus longe recedit.

Planta densissime pulvinata glebam 7–8 cm. diametro formans. Caudex lignosus polycephalus, foliorum reliquiis densissime indutus. Cauliculorum sterilium pars viridis brevissima, pars hypogaea praelonga foliis emarcidis induta ; caules floriferi ad 10 cm. longi erecti flexuosi foliorum paribus 3–4 remotis muniti, plus minusve dense fulvido-pubescentes. Folia basalia dense conferta, 10–15 mm. longa, 1–1.5 mm. lata, linearia, pungentia, rigida, glabra, margine albido-marginata et indurata et minute asperulata ; folia caulina inferiora basalibus similia, superiora circ. 1 cm. longa, dorso pubescentia, margine molliter et dense ciliata. Flores solitarii albi subnutantes ; pedicelli circ. 1 cm. longi dense fulvido-pubescentes. Calyx basi rotundatus vix incrassatus; sepala 6–7 mm. longa, 3–5 mm. lata, ovata vel ovato-lanceolata, apice rotundata, pubescentia et margine dense atque molliter ciliata, ultimo subglabra vel glabra. Petala 13–15 mm. longa, late obovata, vulgo integra. Stamina 10 calycem aequantia glandulis alternantia. Ovarium ovoideum subnitens stylis tribus brevibus coronatum. Capsula matura calycem paulo superans ; semina desunt.

"China :—Yunnan, mountains of the Chungtien plateau, S.E. of Chungtien. Lat. 27° 55′ N. Alt. 11,000–12,000 ft. Cushion plant of 2–5 inches. Flowers white. Ledges and crevices of limestone cliffs. July 1913." G. Forrest. No. 10,459.

* Diels in Notes R.B.G., Edin., v (1912), 182.

A very beautiful species akin to *A. lichiangensis*, W. W. Sm., and to *A. Przewalskii*, Maxim. Its habit recalls that of a large-flowered cushion saxifrage.

3670 **Arenaria pogonantha,** W. W. Sm. Sp. nov.

Species affinis *A. barbatae*, Franch. a qua habitu nano multicauli, caulibus simplicibus, foliis multo minoribus dense fulvo-hirsutis, inflorescentiis paucifloris est diversa.

Planta perennis multicaulis. Radix anguste fusiformis apice squamis induta. Caulis erecti vel suberecti, flexuosi, 7–15 cm. alti, pilis longis articulatis glandulosis fulvidis et nigrescentibus dense induti. Folia basalia desunt; caulina circ. 5 mm. longa, circ. 3 mm. lata, ovata vel ovato-lanceolata, apice obtusiuscula, basi in petiolum 1–2 mm. longum attenuata, integra, textura firma, utraque facie et ad margines pilis longis fulvidis hirsuta, utrinque punctis minutis asperulata. Inflorescentiae 1–3-florae; flores albi; pedicelli ad 2.5 cm. longi hirsuti; bracteae foliaceae 2–3 mm. longae. Sepala circ. 4 mm. longa, ovata, apice obtusa, margine scariosa, dorso pilis fulvidis dense hirsuta. Petala 7–8 mm. longa, late obovata, margine multidenticulata. Stamina 10, calycem paulo excedentia filamentis glabris. Ovarium ovoideum circ. 3 mm. longum stylis duobus 2.5 mm. longis munitum.

"China :—Yunnan, on the western flank of the Shweli-Salween divide. Lat. 25° 20′ N. Alt. 10,000 ft. Plant of 3–5 inches. Flowers creamy white. Stony pasture and on rocks. Aug. 1912." G. Forrest. No. 8935.

3671 **Arenaria xerophila,** W. W. Sm. Sp. nov.

Species affinis *A. longistylae*, Franch. a qua radice tuberosa, foliis majoribus acutis nec apiculatis, sepalis vix apiculatis inter alia divergit; ab *A. linearifolia*, Franch. foliis diversis recognoscitur; ab *A. szechuensi*, Williams foliis multo majoribus, petalis calycem aequantibus inter alia differt.

Planta perennis ramosa diffusa. Radix tubercula fusiformia plura producens. Caules a basi ramosi ramulis pseudo-dichotome patentibus suberecti vel ascendentes, 7–20 cm. alti, plus minusve albido-pilosuli, tarde glabrescentes. Folia 1.5–3.5 cm. longa, 4–8 mm. lata, oblanceolata, apice acuta sed haud apiculata basi in petiolum vix discretum attenuata, breviter connata, integra, textura firma subpapyracea, utrinque subglauca, glabra nisi ad basim sparsim pilosulam, utraque facie punctis parvis notata. Flores in cymas laxissimas paucifloras dispositi vel rarius subsolitarii, albi; pedicelli ad 3 cm. longi dense pilosuli; bracteae foliis subsimiles sed multo minores. Sepala circ. 6 mm. longa, ovato-lanceolata, obtusa, basi dense pilosula, medio viridia,

costula ipsa tantum pilosula, marginibus late scariosa sparsim ciliolata. Petala circ. 8 mm. longa, late obovata, apice rotundata integra. Stamina 10 calycem subaequantia filamentis glabris. Ovarium fere globosum stylis duobus 4–5 mm. longis praeditum.

"China :—Yunnan, in the mountains in the N.E. of the Yangtze bend. Lat. 27° 45′ N. Alt. 10,000 ft. Plant of 3–4 inches. Flowers white. Limy pasture and ledges of limestone cliffs. Sept. 1913." G. Forrest. No. 10,998.

"China :—N.W. Yunnan, in the A-tun-tsu valley. Lat. 28° 28′ N. Alt. 11,000 ft. Plant of 4–8 inches. Flowers white. Open dry pasture. Aug. 1914." G. Forrest. No. 13,210.

531 **Berberis concolor,** W. W. Sm. Sp. nov.

Species valde affinis *B. Vernae*, Schneider, a qua foliis concoloribus magis coriaceis, floribus duplo majoribus recedit.

Frutex 1–2 m. altus compactus. Ramuli glabri teretes vel subteretes, cinerascentes, lenticellis nigris sparsis notati; internodia 1–2 cm. longa; spinae simplices 1–1.5 cm. longae gracillimae flavescentes. Folia 5–10-fasciculata, in eodem fasciculo saepe inaequalia, in petiolum brevem attenuata, 1–2 cm. longa, 3–5 mm. lata, plerumque oblanceolata, apice rotundata vel obtusa breviter mucronata, basi cuneata, margine integra, tenuiter coriacea, concoloria, laxe reticulata nervis utrinque eminentibus. Inflorescentiae densiflorae graciles cum pedunculo ad 1.5 cm. longo ad 4 cm. longae, plus minusve nutantes, glabrae; flores lutei sat magni, complanati 7–8 mm. diametro; pedicelli ad 7 mm. longi gracillimi, basi bracteis subulatis instructi. Sepala exteriora late ovata obtusa circ. 3 mm. longa; interiora obovata circ. 5 mm. longa. Petala 4 mm. longa, obovata, apice incisa, basi breviter unguiculata, glandulis normalibus praedita. Stamina circ. 3 mm. longa. Ovarium cum stylo brevi circ. 3 mm. longum, ovulis duobus. Fructus deest.

"China :—N.W. Yunnan; Tung-chu-ling, 10,000 ft., and A-tun-tsu, 12,000 ft. In the shrub belt on dry exposed hillsides. Compact bush of 4–6 ft. loaded with flowers in full bloom. May 31st, 1913." F. K. Ward. No. 315.

The following is a variety with obovate leaves about 18 mm. long, 9 mm. broad, occasionally with one or two teeth on the margin :—

"E. Tibet :—At Doker-la in the shrub belt at 13,000 ft. July 1913." F. K. Ward. No. 707.

This very floriferous little species of the *Sinensis* group is closely allied to *B. Poiretii*, Schneider, and to *B. Vernae*, Schneider. Of these it comes nearest to *B. Vernae*, which has very small flowers. The variety with the broader leaves but quite similar inflorescence and flower-structure approaches *B. aggregata*,

Schneider, which has fine hairs on the young shoots and peduncles.

Berberis favosa, W. W. Sm. Sp. nov.

Species affinis *B. subcaulialatae*, Schneider et *B. Stapfianae*, Schneider a quibus habitu nano prostrato, inflorescentiis paucifloris inter alia divergit.

Fruticulus nanus prostratus vix 30 cm. altus ramosus; ramuli juniores angulati glabri vel hic illic minutissime puberuli, vetustiores cinerascentes; spinae trifidae graciles circ. 1 cm. longae. Folia in petiolum brevissimum attenuata, subpersistentia, papyracea, 5–12-fasciculata, 1–2 cm. longa, 3–4 mm. lata, oblanceolata, apice subobtusa et mucronata vel acuta vel subrotundata et fere emucronata vel nonnunquam late tricuspidata, basi cuneata, margine integra paulo revoluta, supra viridia, subtus paulo pruinosa, papillosa, utrinque favoso-reticulata costa media inter rugas indistinctissima. Inflorescentiae foliis breviores 1–7-florae, breviter fasciculato-racemosae; pedicelli 4–8 mm. longi, rubidi, basi bracteis squamiformibus apiculatis circ. 1 mm. longis muniti. Flores flavidi 3–4 mm. diametro. Sepala exteriora late ovata 2–3 mm. longa, interiora late elliptica vel suborbicularia 4.5 mm. longa. Petala obovata circ. 4 mm. longa, apice breviter emarginata, basi breviter unguiculata, glandulifera. Stamina circ. 3 mm. longa. Ovarium 3 mm. longum ovulis tribus. Fructus deest.

"Upper Burma:—Hpimaw, in open situations on ridge amongst boulders at 7000 ft.; a prostrate dwarf shrub rising less than a foot from the limestone rock over which its long branches trail. August 1914." F. K. Ward. No. 1852.

Of the now numerous and closely allied species of this group, the above comes nearest to *B. Stapfiana*, Schneider.

Berberis replicata, W. W. Sm. Sp. nov.

Species valde affinis *B. sanguineae*, Franch. a qua foliis multo minoribus revolutis inter alia divergit.

Frutex 1–1.5 m. altus. Ramuli juniores glabri teretes pallido-flavidi, vetustiores cinerei; internodia 1.5 2.5 longa; spinae 3-fidae 1–1.5 cm. longae pallido-flavidae. Folia 3–5-fasciculata, in petiolum brevissimum contracta, 2–3.5 cm. longa, 3–5 mm. lata, lineari-lanceolata, apice acuta longiuscule mucronata, basi cuneata, margine spinis (1–6 paribus) circ. 1 mm. longis praedita, saepe espinosa, ita revoluta ut spinae saepe difficules visu sint, supra opaco-viridia costa media multo impressa nervatione obscura, infra pruinosa costa media eminente straminea nervis lateralibus subobsoletis. Flores 2–8-fasciculati, complanati circ. 7 mm. diametro aurei; pedicelli 1–1.3 cm. longi graciles rubridi

basi bracteis late triangularibus acuminatis muniti. Sepala exteriora late ovata circ. 3 mm. longa, late pellucido-marginata, in sicco saepe medio sanguinea, interiora suborbicularia circ. 4 mm. diametro margine pellucida. Petala vix 4 mm. longa, late obovata, apice emarginata, basi breviter unguiculata glanduligera. Stamina ad sinum petalorum attingentia. Ovarium ovulis 2 praeditum, stylo brevissimo, stigmate latiusculo. Fructus ovatus circ. 5 mm. longus, 4 mm. latus, kermesinus vel scarlatinus tandem fere niger; semina 1–2.

"China :—W. Yunnan, Ma-chang-kai valley, north of Teng-yueh. Lat. 25° 20′ N. Alt. 6000–7000 ft. Spinous shrub of 5 ft. Flowers golden yellow. Rocky open situations. Feb. 1913." G. Forrest. No. 9545.

"Ma-chang-kai valley. Lat. 25° 30′ N. Alt. 7000–8000 ft. Spinous shrub of 4 ft. Fruits dark crimson, almost black. Open situations amongst scrub. Dec. 1912." G. Forrest. No. 9547.

"Lava bed west of Teng-yueh, Yunnan. Lat. 25° N. Alt 5000 ft. Spinous shrub of 3–4 ft. In fruit. Fruits crimson Open situations amongst scrub. May 1912." G. Forrest. No. 7785.

"Hills to the north-east of Teng-yueh. Lat. 25° 10′ N. Alt. 6000–7000 ft. Spinous shrub of 2–4 ft. In fruit. Fruits scarlet. Open situations amongst scrub. July 1912." G. Forrest. No. 8782.

"Shweli-Salween divide, Yunnan. Lat. 25° 30′ N. Alt. 11,000 ft. Spinous shrub of 4–5 ft. In fruit. Fruits deep crimson. In open scrub. Oct. 1917." G. Forrest. No. 16,030.

This new species is closely allied to *B. sanguinea*, Franch. in appearance and in structure of flower. The smaller leaves are strongly revolute, so much so that, viewed from above, the teeth of the margin are not visible. Forrest collected the plant four times in the area round Teng-yueh. I do not find it matched in any collections from the rest of Yunnan.

5935 **Braya heterophylla,** W. W. Sm. Sp. nov.

Species habitu *B. alpinae*, Sternb. et Hoppe; foliis radicalibus longe et graciliter petiolatis, foliis caulinis subnumerosis oblongis, petalis minimis, fructu glabro inter alia bene notata.

Planta 7–15 cm. alta erecta perennis. Radix fusiformi-incrassata multiceps. Caules 2–5, pro genere bene foliati, glabri. Folia basalia et caulina infima petiolo 1.5–3 cm. longo gracillimo basi vaginante suffulta; lamina 6–12 mm. longa, 5–8 mm. lata, late elliptica vel subcordiformis, obtusa, basi plus minusve rotundata, membranacea glabra; folia caulina superiora 4–8, circ. 1.5 cm. longa, 3–4 mm. lata, oblonga vel oblongo-

lanceolata, obtusiuscula, sessilia. Inflorescentia capitato-corymbosa 20–24-flora, ebracteata. Sepala circ. 2 mm. longa, oblonga, obtusa, atroviridia, margine pergamentacea, glabra. Petala circ. 2 mm. longa, spathulata, albida. Stamina edentula libera. Siliqua vix matura lineari-oblonga, circ. 8 mm. longa, paulo curvata glabra, stylo brevi, stigmate capitato, seminibus 4–6, septo deficiente.

" China :—On the Bei-ma Shan, Yunnan, on ledges of cliffs and humus-covered boulders. Lat. 28° 12′ N. Alt. 14,000 ft. Plant of 3–6 inches. Flowers white. July 1917." G. Forrest. No. 14,385.

Braya verticillata, W. W. Sm. Comb. nov.

Cardamine? verticillata, Jeffrey et W. W. Sm. in Notes Roy. Bot. Gard. Edin., viii (1913), 120.

" China :—N.W. Yunnan, near A-tun-tsu, at an altitude of 15,000 ft. July 1911." F. K. Ward. No. 17.

" On the Bei-ma Shan, Yunnan, on open stony moorland. Lat. 28° 12′ N. Alt. 15,000 ft. Plant of 1–2 inches. Flowers white, fragrant. June 1917." G. Forrest. No. 13,968.

" Tibet :—Tsarong, on the Ka-gwr-pw, Mekong-Salween divide, on screes and ledges of cliffs. Lat. 28° 25′ N. Alt. 14,000–15,000 ft. Plant of 3–4 inches. Flowers white or pale rose-lavender ; fragrant. July 1917." G. Forrest. No. 14,490.

The material now available has immature fruits which show that the plant cannot be placed in *Cardamine,* and that it is congeneric with *Braya sinensis,* Hemsl. and *B. uniflora,* Hook. f. et Thoms.

Camelina yunnanensis, W. W. Sm. Sp. nov.

Species affinis *C. albiflorae,* Boiss. et *C. microcarpae,* Andrz. ; foliis plus minusve incisis, floribus minoribus laete flavis notata.

Planta 30–60 cm. alta, annua, pilosa. Caulis bene foliatus pilis albidis praesertim ad partem inferiorem plus minusve dense indutus. Folia basalia . . . . ; caulina inferiora circ. 5 cm. longa, 1 cm. lata, ambitu lanceolata, runcinato-incisa, lobo terminali denticulato circ. 3 cm. longo, acuta, basi cordato-auriculata, membranacea, supra pilis albidis conspersa, infra ad costam densissime pilosa, ceteroquin mediocriter pilis praedita ; caulina superiora 3–4 cm. longa, 3–4 mm. lata, lanceolato-linearia vel linearia, acuminata, cordato-auriculata, grossiuscule denticulata. Racemi circ. 6 cm. longi multiflori inflorescentiam paniculatam circ. 20 cm. longam formantes. Flores parvi. Sepala circ. 1.5 mm. longa, cymbiformia obtusa pallido-flava. Petala spathulata circ. 1 mm. longa laete flava. Stamina 1.5

mm. longa. Ovarium 1.5 mm. longum ovoideum stylo 0.5 mm. longo. Capsula immatura.

"China :—Sung-kwei valley, Yunnan, in dry open pasture. Lat. 26° 15′ N. Alt. 6000 ft. Plant of 1–2 ft. Flowers bright yellow. May 1917." G. Forrest. No. 13,776.

The above appears to be the first species of Camelina recorded from China.

5315 **Cardamine calcicola,** W. W. Sm. Sp. nov.

Species habitu *C. pratensis*, Linn. et in conspectu Schulziano* prope eam speciem ponenda sed foliis radicalibus simplicibus praedita ; affinitas vera est fortasse cum *C. insigni*, O. E. Schulz sociisque ejus sed foliis caulinis bijugis divergit.

Rhizoma caespitosum. Caulis 15–30 cm. longus, erectus, simplex, remote 2–4-folius, pilis patentibus incanis subsparsim indutus. Folia radicalia circ. 10, petiolo ad 10 cm. longo sparsim incano praedita, simplicia, reniformia, circ. 2 cm. longa, circ. 2.5 cm. lata, antice crenis latis circ. 7-crenata, basi alte cordata, papyracea, utrinque subconcoloria vel nonnunquam infra rubescentia, supra glabra vel subglabra papillosa, infra ad nervos sparsim albido-pilosa ; folia caulina 2–4, petiolo 1–2 cm. longo pilosulo praedita, bijuga, 2–2.5 cm. longa et lata ; foliola 1 cm. paulo excedentia, vulgo 5–8 mm. lata, vix vel breviter petiolulata, obovata, integra vel supra medium dentibus duobus praedita, supra glabra vel sparsim pilosula, infra pilosuliora ; foliolum terminale sessile, lateralibus paulo majus. Racemus (in fructu) circ. 10 cm. longus, 15–20-florus, ebracteatus, sparsim pilosulus. Pedicelli fructiferi ad 1.5 cm. longi, fere erecti, sparsim pilosuli. Flores non visi. Siliquae suberectae, ad 25 mm. longae, 1–1.2 mm. latae, in stylum circ. 2 mm. longum attenuatae ; stigma conspicuum stylo sublatius ; valvae stramineae vel violaceae. Semina circ. 1.5 mm. longa, 1 mm. lata, oblongo-ovalia, brunnea.

"China :—Yunnan, mountains in the N.E. of the Yangtze bend. Lat. 27° 45′ N. Alt. 11,000–12,000 ft. Plant of 6–12 inches. In fruit. Crevices of limestone cliffs. July 1913." G. Forrest. No. 10,471.

5316 **Cardamine scoriarum,** W. W. Sm. Sp. nov.

Species haec quoad habitum *C. macrophyllam*, Willd. in mentem vocat sed foliis trifoliolatis divergit ; in conspectu Schulziano † in vicinitatem *C. fragariifoliae*, O. E. Schulz ponenda sed affinitas est cum *C. macrophylla*, Willd. Radix descendens incrassata. Caulis 30–90 cm. altus, erectus, simplex vel superne

* Engl. Bot. Jahrb., xxxii (1902), p. 337. † Ibid., 334.

pauciramosus, remotiuscule 10–20-folius, foliis inferioribus vulgo delapsis, glaber vel subglaber. Folia radicalia et inferiora desunt ; superiora petiolo ad 5 cm. longo alato sparsim albo-pilosulo praedita, trifoliolata ; raro foliolum quartum in medio petiolo additum ; foliola subaequalia, petiolulo 2–3 mm. longo pilosulo instructa, anguste ovata, circ. 6 cm. longa, circ. 3 cm. lata, apice acuta vel subacuminata, basi in petiolulum cuneata, margine subalte serrata, serraturis apiculatis, in sicco membranacea, utrinque plus minusve setaceo-pilosula. Racemus florifer corymbosus, deinde elongatus, 20–30-florus. Pedicelli floriferi inferiores circ. 1 cm. longi minute et sparsim pilosuli. Flores 8–10 mm. longi. Sepala 4 mm. longa, 2 mm. lata, oblonga, obtusa. Petala pallide rosea, obovata, ungue 2–3 mm. instructa, vix emarginata. Stamina longiora ad 5 mm. longa antheris 1 mm. longis. Ovarium cylindricum ad 4 mm. longum glabrum ; stigma stylo latius. Fructus maturus deest.

" China :—Yunnan ; flank of volcanic mountain to north-west of Teng-yueh. Lat. 25° 10′ N. Alt. 7000 ft. Plant of 2–3 ft. Flowers pale rose. Moist shady situations in thickets. June 1912." G. Forrest. No. 8201.

" Yunnan ; divide between the Shweli and Teng-yueh valleys. Lat. 25° N. Alt. 6000–7000 ft. Plant of 1–2½ ft. Flowers pale magenta-rose. Moist shady situations on the margins of thickets. May 1912." G. Forrest. No. 7947.

Deutzia dumicola, W. W. Sm. Sp. nov.

Species affinis *D. asperae*, Rehder et *D. discolori*, Hemsl. ; ramulis asperatis, foliis parvis acutis haud acuminatis pauci-nervatis breviter petiolatis notata.

Frutex ad 2 m. altus ; ramuli graciles hornotini et annotini pilis stellatis densis asperati. Folia petiolo 1–2 mm. longo dense stellato-piloso suffulta ; lamina 15–25 mm. longa, 8–18 mm. lata, ovata vel ovato-lanceolata, apice plus minusve acutata, basi rotundata vel late cuneata, margine serrulata, membranacea, utrinque tactu scabridula, supra opaco-viridis pilis stellatis 4–7-radiatis densiuscule conspersa, subtus vix pallidior pilis 5–10-radiatis subdense conspersa, nervis 3–4 paribus. Cymae pauciflorae, plerumque 3–5-florae, ramulos breves e ramo longo virgato ortos terminantes, sessiles vel breviter pedunculatae ; pedicelli ad 5 mm. longi, pilis stellatis asperati. Calyx circ. 3 mm. longus, dentibus triangulari-lanceolatis tubum aequantibus vel paululo brevioribus. crustaceo-stellato-pilosus. Petala 6–7 mm. longa, oblonga, alba, extra stellato-pilosa. Stamina petalis fere dimidio breviora, filamentis exterioribus apice bidentatis antheram vix superantibus, interioribus apice bifidis

antheram circa medium affixam gerentibus. Styli 4–5 staminibus paulo breviores. Fructus deest.

"China :—Yangpi valley, Yunnan, in open scrub. Lat. 25° 25′ N. Alt. 5000 ft. Shrub of 4–6 ft. Flowers white. April 1917." G. Forrest. No. 13,702.

"Yangpi valley, on rocks amidst scrub. Lat. 25° 40′ N. Alt. 6000–7000 ft. Shrub of 4–6 ft. Flowers white. May 1913." G. Forrest. No. 9904.

"Hsia-kuan valley, Yunnan, in open scrub. Lat. 25° 40′ N. Alt. 5000–6000 ft. Shrub of 4–6 ft. Flowers white. April 1914." G. Forrest. No. 12,359.

The affinity of this species is possibly with *D. Monbeigii*, W. W. Sm., and members of the subsection Cymosae of Rehder.

Deutzia Monbeigii, W. W. Sm. Sp. nov.

Species affinis *D. staminеae*, Br. a qua foliis atque calycis lobis differt ; apud species chinenses in vicinitatem *D. coriaceae*, Rehder et *D. crassifoliae*, Rehder ponenda ; foliis parvis ovatis vel ovato-lanceolatis subtus albidis crustaceo-stellato-pilosis bene notata.

Frutex 1–1.5 m. altus ramulis gracilibus hornotinis rufo-brunneis densiuscule stellato-pilosis, annotinis rubidis, vetustis cinerascentibus. Folia petiolo circ. 2 mm. longo dense stellato-piloso instructa ; lamina plerumque 14–18 mm. longa, 7–8 mm. lata, ovata vel ovato-lanceolata, apice obtusa vel subacutata haud acuminata, basi rotundata vel late cuneata, margine minute denticulata, subcoriacea utrinque tactu scabridula, supra opaco-viridis pilis 5–8-radiatis densiuscule induta, infra indumento albido crustaceo pilis 12–14-radiatis composito dense obtecta, utrinsecus 3–4-costata. Cyma 5–12-flora, plerumque circ. 7-flora, breviter pedunculata vel fere sessilis axibus rufo-brunneis stellato-pilosis ; pedicelli graciles tubum calycis superantes vel subaequantes. Calyx circ. 3 mm. longus crustaceo-stellato-pilosus, dentibus circ. 1 mm. longis triangularibus. Petala circ. 9–10 mm. longa, circ. 4 mm. lata, oblonga vel obovata, alba, extra stellato-pilosa, aestivatione valvata. Stamina circ. 5 mm. longa ; dentes exteriorum ad basim antherarum attingentes ; dentes interiorum antheris breviores. Styli 3–4 stamina fere aequantes. Fructus (si planta Forrestiana huc recte allocata) subglobosus, circ. 3 mm. longus, 2.5 mm. latus, crustaceo-stellato-pilosus, calycis dentibus persistentibus.

"China :—Tseku, N.W. Yunnan. May." Monbeig. No. 7 (1912), in Herb. Edin.

"Wei Hsi valley, Yunnan, in open scrub. Lat. 27° 18′ N. Alt. 10,000 ft. Shrub of 3–5 ft. In fruit. Nov. 1917." G. Forrest. No. 15,631.

5524 **Draba incana,** Linn., var. **microphylla,** W. W. Sm. Var. nov.

Habitu gracillimo, foliis caulinis circ. 5 mm. longis integris, ovario glabro bene notata. Planta circ. 12 cm. alta caulibus subflexuosis.

" E. Tibet :—On rocks at 13,000 ft. near Ka-gwr-pw Temple, close to Chinese frontier. July 1913." F. K. Ward. No. 885.

5521 **Draba involucrata,** W. W. Sm. Sp. nov.

Draba alpina, Linn., var. *involucrata,* W. W. Sm., in Notes Roy. Bot. Gard. Edin., viii (1913), 121.

Species affinis *D. alpinae,* Linn. a qua habitu, stylo longiusculo, fructu diverso recedit.

Planta 2.5–7.5 cm. alta dense caespitosa. Caules numerosi caespitem densum formantes multo intertexti pro maxima parte subhypogaei vaginis emarcidis albidis induti. Folia eis *D. alpinae* subsimilia, 3–8 mm. longa, circ. 3 mm. lata, oblanceolata vel obovata, pilis furcatis et stellatis conspersa vel longiuscule ciliata vel tandem glabra. Inflorescentia plerumque 3–5-flora 2 cm. raro superans ; scapus aphyllus pilis furcatis plus minusve dense obsitus ; pedicelli inferiores 4-5 mm. longi. Sepala circ. 2 mm. longa elliptica obtusa glabra vel dorso pilis furcatis conspersa pallide viridia. Petala 4–5 mm. longa obovata emarginata laete aurea. Ovarium ovatum glabrum stylo longiusculo nonnunquam ovarium subaequante. Fructus ellipticus circ. 9 mm. longus, 4 mm. latus, stylo circ. 2 mm. longo coronatus, saepe semitortus, glaber, nitenti-viridis ; semina vulgo 4–8.

" China :—Eastern flank of the Lichiang Range, Yunnan, in crevices and edges of moist limestone cliffs. Lat. 27° 25′ N. Alt. 11,000–12,000 ft. Tufted plant of 1–3 inches. Flowers bright golden yellow. June 1910." G. Forrest. No. 5732.

" Western flank of the Lichiang Range, in crevices of limestone cliffs. Lat. 27° 20′ N. Alt. 12,000 ft. Plant of 1–2 inches. Flowers yellow. June 1910." G. Forrest. No. 5829.

" Eastern flank of the Lichiang Range, on boulders and limestone drift. Lat. 27° 40′ N. Alt. 15,000–16,000 ft. Matted plant of 1 inch. Flowers golden yellow. July 1910." G. Forrest. No. 6138.

" A-tun-tsu, N.W. Yunnan, 15,000–16,000 ft. An alpine grassland plant growing among dwarf rhododendrons. July 1911." F. K. Ward. No. 18.

" Ka-gwr-pw, S.E. Tibet, on rocks and screes at 16,000 ft. July 1913." F. K. Ward. No. 823.

" On the Bei-ma Shan, Yunnan, in open moist rocky pasture. Lat. 28° 12′ N. Alt. 15,000 ft. Semi-cushion plant of 1 inch.

Flowers deep golden yellow, fragrant. June 1917." G. Forrest. No. 13,969.

" Mekong-Salween divide, Yunnan, on open cliffs and moist stony pasture. Lat. 28° 20′ N. Alt. 14,000 ft. Matted plant of 1–2 inches. Flowers deep orange-yellow. July 1917." G. Forrest. No. 14,086.

" On the Bei-ma Shan, Yunnan, in open moist stony pasture and on boulders and cliffs. Lat. 28° 12′ N. Alt. 13,000 ft. Matted plant of 1–2 inches. In fruit. Aug. 1917." G. Forrest. No. 14,669.

Also Aug. 1917. G. Forrest. No. 15,167.

The following appears to be a form of the above, with more pilose scapes and a dark green calyx :—

" Mekong-Salween divide, Yunnan, in open stony pasture and on ledges of cliffs. Lat. 28° 12′ N. Alt. 14,000 ft. Plant of 1–2 inches. Flowers golden yellow. July 1917." G. Forrest. No. 14,360.

The earlier specimens were at first placed under *D. alpina*, Linn., but with additional material including fruit now available, it is preferable to give the plant specific rank. It is very different in its low caespitose habit, its long style, and twisted shining fruit. It is possibly the same as *D. alpina*, Linn., var. *leiophylla*, Franch. (Plant. Delav., p. 59), which I have not seen.

5524 **Draba jucunda,** W. W. Sm. Sp. nov.

Species affinis *D. involucratae*, W. W. Sm. a qua floribus majoribus, stylo longiore, ovario oblongo dense albo-setosulo differt.

Planta 3–10 cm. alta dense caespitosa radice fusiformi multicipite praedita. Caules numerosi caespitem densum formantes multo intertexti pro maxima parte subhypogaei ; caules steriles breves bene foliati ; caules floriferi scapiformes aphylli pilis furcatis albidis dense obsiti. Folia eis *D. involucratae* subsimilia, 4–10 cm. longa, 3–4 mm. lata, oblanceolata vel plus minusve elliptica, obtusa, membranacea, utrinque et ad margines pilis furcatis plus minusve conspersa. Inflorescentia corymboso-racemosa 2–10-flora, floribus inferioribus saepe subremotis, pedicellis 2–7 mm. longis pilosulis. Sepala 3–4 mm. longa, cymbiformia, obtusa, viridia, margine submembranacea, dorso pilis furcatis conspersa. Petala circ. 7 mm. longa, anguste obovata, breviter emarginata, laete flava. Ovarium oblongum pilis setaceis dense indutum stylo longiusculo coronatum. Fructus vix maturus circ. 4.5 mm. longus pilis persistentibus.

" China :—N.W. Yunnan. 1913." F. K. Ward. No. 1023A.

" Mekong-Salween divide, Yunnan, in open stony pasture

and on boulders. Lat. 28° 12′ N. Alt. 13,000 ft. Matted plant of 3–4 inches. Flowers bright yellow. July 1917." G. Forrest. No. 14,298.

" On the Bei-ma Shan, Yunnan, on open stony pasture and cliffs. Lat. 28° 12′ N. Alt. 14,000 ft. Matted plant of 1–2 inches. Flowers bright yellow. July 1917." G. Forrest. No. 14,495.

A densely caespitose plant with a wealth of bright yellow flowers; it is closely allied to the preceding species and to *A. alpina*, Linn.

555 **Draba lichiangensis,** W. W. Sm. Sp. nov.

Species affinis *D. tibeticae*, Hook. f. et Thoms. a qua foliis multo minus tomentosis et fructibus ovoideis glabris recedit.

Planta pusilla caespitosa 2–5 cm. alta; pars glebae inferior e caulibus vetustis intertextis composita petiolis emarcidis nigricantibusque dense induta, unde rosulae foliorum radicalium oriuntur. Folia radicalia 4–7 mm. longa, 1–2 mm. lata, oblanceolata vel spathulata, apice obtusa vel subacuta, basi in petiolum vix discretum attenuata, integra vel paucidentata, membranacea, utrinque densiuscule stellato-incana; costa media obscura. Scapi breves aphylli vel ad basim inflorescentiae bracteis foliaceis 1–2 instructi. Inflorescentiae 5–10-florae floribus primo subcapitato-aggregatis. Sepala oblonga circ. 1.5 mm. longa, atroviridia, pilis stellatis et furcatis plus minusve conspersa. Petala oblanceolata vel obovata, sepalis fere duplo longiora, alba. Ovarium ovoideum glabrum stylo brevi instructum. Fructus maturus ovoideus circ. 3 mm. longus, 2.5 mm. latus.

Draba tibetica, Diels nec Hook. et Thoms. in Notes Roy. Bot. Gard., vii (1912), 104.

" China:—Yunnan, western flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 13,000 ft. Plant of 1–2 inches. Flowers white. Crevices of limestone cliffs. May 1910." G. Forrest. No. 5698.

" Eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 14,000–15,000 ft. Plant of 1–2 inches. Flowers white. Crevices of limestone boulders. July 1910." G. Forrest. No. 6099. Also No. 2177.

" Mekong-Salween divide. Lat. 28° 12′ N. Alt. 13,000 ft. Tufted plant of 1–2 inches. Flowers white. On stony moist meadows. July 1917." G. Forrest. No. 14,282.

556 **Draba modesta,** W. W. Sm. Sp. nov.

Species ex affinitate *D. rupestris*, R. Br. a qua inflorescentia congesta foliis caulinis superioribus involucrata, ovario glabro inter alia differt.

Planta nana in specimine nostro circ. 3 cm. alta, radice fusiformi praedita, ad collum foliis petiolisque emarcidis induta. Caules 2–3 cm. alti, plures, debiles, suberecti, in parte superiore 2–3-foliati, infra nudi, plus minusve dense albido-patenti-pilosi. Folia radicalia rosulata cum petiolo vix discreto alato ad 2.5 cm. longa, circ. 5 mm. lata, anguste oblanceolata, vel subspathulata, apice acutata, basi cuneata, integra vel dentibus 1–2 instructa, membranacea, pilis simplicibus et bifurcatis utrinque sparsiuscule et longiuscule pilosa; costa media conspicua straminea; folia caulina radicalibus subsimilia sed sessilia, paulo breviora, vulgo 2–3, inflorescentiam congestam superantia et quasi-involucrantia. Inflorescentia 5–10-flora. Sepala circ. 1.5 mm. longa, ovalia, obtusa, glabra vel pilis perpaucis instructa. Petala 2–2.5 mm. longa, anguste obovata vel oblanceolata, alba. Ovarium glabrum stylo brevi instructum. Fructus immaturus oblongus.

"China:—N.W. Yunnan at A-tun-tsu, on rocks and screes at 15,000 ft. August 1913." F. K. Ward. Nos. 943. 737.

3529 **Draba oreodoxa,** W. W. Sm. Sp. nov.

Species inter congeneres occidentali-chinenses distinctissima; flores *D. surculosam*, Franch. et *D. yunnanensem*, Franch. in mentem vocant sed plantae habitus omnino diversus est.

Planta circ. 5–10 cm. alta caespitosa radice fusiformi praedita. Caules numerosi (ad 12 in nostra scheda) flexiles basi subdecumbentes, supra erectiusculi, pilis simplicibus et furcatis et stellatis bene induti. Folia radicalia dense rosulata 1 cm. longa vel paulo ultra, circ. 4 mm. lata, oblanceolata vel spathulata vel oblonga, apice rotundata vel obtusa, basi in petiolum indistinctum attenuata, integra vel obscure denticulata, tenuiter papyracea, undique pilis furcatis stellatisque plus minusve instructi; costa media obscura; folia caulina plerumque 3–5, ovata vel ovato-lanceolata, sessilia, basi rotundata, vulgo distincte denticulata, quoad magnitudinem et indumentum radicalibus similia. Inflorescentiae 10–15-florae, corymboso-racemosae, rhachi pedicellisque pilosulis; flores infimi foliis superioribus 1–2 bracteati; pedicelli floribus paulo longiores. Flores pro planta magni aureo-flavi. Sepala ovata vel ovalia circ. 2.5 mm. longa, medio viridia, marginibus pallido-flava, extra pilis furcatis conspersa. Petala 6–7 mm. longa, late obovata, emarginata, glabra. Fructus immaturus ovoideus circ. 2.5 mm. longus, 2 mm. latus, glaber, stylo 1 mm. longo terminatus.

"China:—Yunnan, on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 13,000 ft. Plant of 2–4 inches. Flowers golden yellow. On rocks and stony pasture. July 1910." G. Forrest. No. 6141.

Draba Wardii, W. W. Sm. Sp. nov.

Species valde affinis *D. gracillimae*, Hook. f. et Thoms. a qua caulibus foliisque haud stellato-incanis, sepalis glabris inter alia differt.

Planta pusilla in scheda nostra circ. 8 cm. alta, radice fusiformi praedita. Caules plures gracillimi, flexuosi, paucifoliati, pilis simplicibus et furcatis subsparsim instructi. Folia radicalia rosulata circ. 1 cm. longa, circ. 2.5 mm. lata, oblanceolata vel spathulata, apice obtusissima, basi in petiolum vix discretum attenuata, integra, membranacea, utrinque et ad margines pilis paucis simplicibus et furcatis conspersa; costa media subconspicua; folia caulina circ. 6 mm. longa ad 4 mm. lata, sessilia, ovata vel ovalia, integra vel dentibus duobus praedita, ciliata, ceterum subglabra. Inflorescentiae circ. 4-florae, laxe racemosae, floribus inferioribus saepe bracteatis. Sepala circ. 1.5 mm. longa, ovalia, glabra. Petala sepalis fere duplo longiora, obovata, flava. Ovarium glabrum. Fructus deest.

"E. Tibet:—At Ka-gwr-pw, near the Yunnan frontier, in Alpine grassland. Alt. 15,000 ft. July 1913." F. K. Ward. No. 849.

This species is very closely allied to the Himalayan species described by Hooker as *D. gracillima*. The leaves of the latter plant are hoary with stellate hairs.

Gaultheria prostrata, W. W. Sm. Sp. nov.

Species affinis *G. trichophyllae*, Royle a qua foliis ellipticis, floribus 1–3-natis ramulos terminantibus, antheris biaristatis, ovario pubescente divergit.

Frutex prostratus habitu *G. trichophyllae*, Royle, ramis 10–20 cm. longis, junioribus pubescentibus, senioribus tarde glabrescentibus cinerascentibus. Folia petiolo circ. 1 mm. longo glabro praedita; lamina 10–12 mm. longa, 6–8 mm. lata, elliptica, apice rotundata vel plus minusve obtusa, basi late cuneata, margine crenulata, crenis nonnunquam minute apiculatis, papyracea, glabra, supra laete viridis, infra pallidior punctis nigris saepe conspersa, reticulo venarum utrinque conspicuo supra immerso. Flores 1–3 ad apicem ramorum plerumque dispositi, racemum brevissimum saepe formantes; axis pubescens bracteis pluribus ovatis 2–3 mm. longis viridibus margine roseis ornata; pedicelli circ. 1 mm. longi. Calycis dentes ovati circ. 2 mm. longi acutiusculi. Corolla late campanulata, alba, circ. 4 mm. longa, lobis 1 mm. longis ovato-triangularibus. Stamina cum aristis circ. 2 mm. longa, filamentis complanatis minutissime puberulis, antheris biaristatis supra vix productis. Ovarium depresso-globosum minute pubescens stylo cylindrico fere 2 mm. longo. Fructus deest.

"China :—Mekong-Salween divide, Yunnan, in open moist pasture and on boulders. Lat. 28° 12′ N. Alt. 14,000 ft. Prostrate shrub of 4–8 inches. Flowers white. July 1917." G. Forrest. No. 14,371.

4329 **Gaultheria tetramera,** W. W. Sm. Sp. nov.

Species ex affinitate *G. fragrantissimae*, Wall. et *G. Veitchianae*, Craib; habitu plerumque humiliore, foliis minoribus, floribus tetrameris minoribus inter alia notata.

Fruticulus 15–60 cm. altus, rarius ad 1.5 m. Caules e caudice crasso saepe 2–6, erecti vel basi decumbentes, graciles, hornotini setis longis brunneis dense obsiti, annotini tarde glabrescentes, vetustiores saepe moribundi. Folia petiolo 2–3 mm. longo primum parce setosulo praedita; lamina 3–5.5 cm. longa, 1–2.5 cm. lata, late elliptica vel elliptico-lanceolata vel oblanceolata, apice rotundata vel plus minusve acutata, apiculata, basi late cuneata, margine serrulata, papyracea, supra opaco-viridis glabra, infra pallidior pedibus setarum nigridis notata; nervi 3–4 paria subtus eminentes. Inflorescentiae numerosae axillares, saepe ex axillis infimis ortae, plerumque 5-10-florae, foliis breviores; rhachis 1–2 cm. longa, dense pubescens fere ad basim florifera; bracteae ovatae acutae 1.5 mm. longae ciliolatae; bracteolae sub calycem positae, 1–1.5 mm. longae, ovatae acuminatae minute pilosulae et ciliolatae; pedicelli 1–2 mm. longi pubescentes. Calyx circ. 3 mm. longus; lobi ovati acuti minute ciliolati. Corolla ovoideo-tubulosa vix 5 mm. longa, viridi-alba, ore angusto, lobis quatuor ovatis minimis. Stamina in speciminibus nostris multo reducta antheris deficientibus. Ovarium superum quadriloculare dense et minute pilosulum stylo cylindrico 2 mm. longo pilosulo. Fructus globosus 5–6 mm. diametro laete caeruleus, basi bracteolis persistentibus praeditus, apice lobis calycis succulentis coronatus; semina numerosa angulata.

"China :—Hills to the east of Teng-yueh, Yunnan, in thickets in side valleys. Lat. 25° N. Alt. 6000 ft. Undershrub of 6–12 inches. Flowers greenish-white, fragrant. May 1912." G. Forrest. No. 7702.

"Hills to the east of Teng-yueh in shady situations amongst rocks. Lat. 25° N. Alt. 6500 ft. Dwarf undershrub of 6–12 inches. Flowers white? In fruit. July 1912." G. Forrest. No. 8786.

"Hills to the east of Teng-yueh, in open situations amongst scrub. Lat. 25° N. Alt. 7000–8000 ft. Undershrub of 1–2 ft. In fruit; fruits bright blue. Nov. 1912." G. Forrest. No. 9331.

"Shweli-Salween divide, Yunnan, on margins of thickets and in cane brakes. Lat. 25° 20′ N. Alt. 11,000 ft. Under-

shrub of 2 ft. In fruit; fruits purple-blue. Oct. 1917." G. Forrest. No. 15,986.

"S.E. Tibet:—On Ka-gwr-pw, Mekong-Salween divide, province of Tsarong, in thickets and rhododendron scrub. Lat. 28° 35′ N. Alt. 13,000 ft. Shrub of 6–9 inches. In fruit; fruits deep blue. Sept. 1917." G. Forrest. No. 14,882.

The following is a larger shrub, but agrees in the details of the flower showing the same tetramery and reduced stamens:—

"China:—Divide between the Shweli and Teng-yueh valleys, in open situations amongst scrub. Lat. 25° N. Alt. 7000 ft. Shrub of 3–5 ft. Flowers white? In fruit. Aug. 1912." G. Forrest. No. 8757.

2717 **Hydrangea subferruginea,** W. W. Sm. Sp. nov.

Species affinis *H. yunnanensi,* Rehder; ramulis molliter ferrugineo-hirsutis, foliis grosse denticulatis ad costam dense ferrugineo-hirsutis, petalis tarde deciduis inter alia bene notata.

Frutex 2.4–3.6 m. altus ramulis hornotinis molliter ferrugineo-hirsutis, pilis plus minusve patentibus. Folia petiolo 1–1.5 cm. longo dense patenti-ferrugineo-hirsuto praedita; lamina 12–14 cm. longa, 4–6 cm. lata, oblonga vel lanceolato-oblonga vel oblanceolato-oblonga, apice caudato-acuminata, basi cuneata, margine subirregulariter grossi-denticulata, membranacea, supra opaco-viridis, setulis adpressis conspersa ad costam dense strigilloso-villosa, subtus pallidior undique setulis densiuscule adspersa ad costam dense ferrugineo-hirsuta, nervis utrinsecus 10–12. Cyma fere plana radiis 5–7 oppositis dense ferrugineo-hirsutulis. Flores steriles circ. 4 cm. diametro sepalis 3–4 late ovatis albis paucidentatis; flores fertiles albidi (?) pedicellis 2–3 mm. longis suffulti. Calycis dentes lanceolati subacuminati circ. 2 mm. longi. Petala circ. 4 mm. longa lanceolata, tarde decidua, sub maturitatem antherarum persistentia et plus minusve reflexa. Stamina longiora petalis paulo breviora. Ovarium semisuperum stylis 3. Fructus deest.

"Upper Burma:—Htawgaw, valley of Naung-Chaung, Lashi country. In jungle in damp shady gulleys. Small scarcely branched shrub of 8–12 ft., of loose habit. Flowers white. May 1914." F. K. Ward. No. 1542.

4438 **Justicia xantholeuca,** W. W. Sm. Sp. nov.

Species sectionis *Calophanoidis* et affinis *J. salicifoliae,* T. Anders. et *J. Neesianae,* Wall. a quibus habitu et bracteis haud spathulatis inter alia divergit; ab *J. flava,* Kurz foliis multo minoribus recedit.

Fruticulus ex collectore circ. 30 cm. altus. Caules erecti

vel suberecti, graciles, subteretes, ramosi ramulis subpatentibus, primo minute et subscabride pilosuli, deinde minute lineolati. Folia petiolo 2–5 mm. longo pilosulo suffulta ; lamina 2–3 cm. longa, 7–10 mm. lata, lanceolata, apice plus minusve acuminata, basi in petiolum cuneata, integra, papyracea, utrinque ad costam minute et adpresse pilosula, cetera sparsim pilosula vel glabrescens. Flores in axillis fere omnibus orientes 4–5 fasciculati ; bracteae 5 mm. longae vel ultra, anguste oblanceolatae vel lanceolatae, ut folia indutae ; bracteolae subulatae vel anguste lanceolatae vel ovatae et minutae ; pedicelli brevissimi. Calyx pallide viridis circ. 5 mm. longus in lobos lineari-lanceolatos acuminatos ad costulam albo-pilosos fere ad imum fissus. Corolla circ. 8 mm. longa, ex collectore alba, in sicco flavescens, extra sparsim pilosula ; structura corollae et genitalium cum ea *J. yunnancnsis* congruit. Fructus glaber seminibus quatuor tuberculato-verrucosis stramineis.

"China :—Yunnan, pâtures des collines à Ko-koui. Alt. 1800 m. ; arbrisseau ou plante sous-ligneuse ; fl. blanches ; September." E. E. Maire. No. 343 (1913) in Herb. Edin.

4439 **Justicia xerobatica,** W. W. Sm. Sp. nov.

Species sectionis *Calophanoidis* affinis *J. salicifoliae*, T. Anders. ejusque sociis a quibus habitu prostrato et radicante inter alia distinguitur.

Planta prostrata basi lignosa caulibus ad 30 cm. longis gracilibus flexuosis ad nodos saepe radicantibus apice ascendentibus minute albido-crispato-pilosulis. Folia petiolo 2–3 mm. longo pilosulo praedita ; lamina 1–2 cm. longa, 5–8 mm. lata, suborbicularis vel late obovata vel rarius lanceolata, apice rotundata vel obtusa, basi cuneata, integra, tenuiter papyracea, utrinque praesertim ad nervos minute pilosula. Flores vulgo in axillis superioribus orientes 1–3 fasciculati ; bracteae 3–4 mm. longae late obovatae vel suborbiculares foliaceae, ut folia indutae ; bracteolae minutae ovatae vel subulato-lanceolatae ; pedicelli vix nulli. Calyx viridis circ. 5 mm. longus in lobos lineari-lanceolatos acuminatos ad costulam pilosos ad marginem scariosos fere ad imum fissus. Corolla ex collectore alba, in sicco flavescens, circ. 9 mm. longa, extra sparsim pilosula ; corollae structura et genitalia cum eis *J. yunnanensis* congruunt. Fructus maturus abest.

"China : — Yunnan, tertres-coteaux calcaires à La-kou. Alt. 2400 m. ; plante vivace, rampante, sous-ligneuse ; fl. blanches ; October." E. E. Maire. No. 382 (1914) in Herb. Edin.

Justicia xerophila, W. W. Sm. Sp. nov.

Species sectionis *Calophanoidis* affinis speciei praecedenti a qua habitu gracillimo suberecto, floribus minoribus, calyce diverso recedit.

Planta suberecta basi sublignosa caulibus circ. 10 cm. longis gracillimis flexuosis minute fulvido-pilosulis. Folia petiolo 1–3 mm. longo pilosulo instructa; lamina vulgo 1 cm. longa, circ. 4 mm. lata, lanceolata vel oblanceolata, apice acuta vel obtusiuscula, haud acuminata, basi cuneata, integra, tenuiter papyracea, utrinque ad nervos minute pilosula, ceterum sparsissime pilosula. Flores in axillis fere omnibus orientes vulgo 1–2-nati; bracteae 3–5 mm. longae late obovatae vel suborbiculares foliaceae, ut folia indutae; bracteolae circ. 2 mm. longae, sublineares. Calyx viridis circ. 5 mm. longus in lobos sublineares acuminatos sparsim pilosulos vel subglabros fere ad imum fissus. Corolla ex collectore alba, in sicco flavescens, 7–8 mm. longa, extra fere glabra; corollae structura et genitalia cum eis *J. yunnanensis* congruunt. Fructus glaber seminibus quatuor tuberculato-rugosis.

"China :—Yunnan, tertres arides—pied des montagnes calcaires à La-kou. Alt. 2400 m.; plante vivace, sous-ligneuse, naine gazonnante; fl. blanches. July." E. E. Maire. No. 196 (1913) in Herb. Edin.

Justicia xylopoda, W. W. Sm. Sp. nov.

Species affinis *J. yunnanensi*, W. W. Sm. infra descriptae a qua basi perlignosa, habitu nano ramosissimo, foliis minoribus discriminatur.

Planta nana fruticosa 7–30 cm. alta, caudice crasso lignoso, basi ramosissima; caules plus minusve decumbentes, apice ascendentes, minute fulvido- vel albido-pilosuli. Folia petiolo 2–3 mm. longo pilosulo instructa; lamina 10–13 mm. longa, 4–5 mm. lata, lanceolata vel subelliptica, apice obtusa, basi cuneata, integra, tenuiter papyracea, utrinque minute et sparsim pilosula, ad nervos vix densius. Flores vulgo in axillis superioribus orientes 1–3-fasciculati; bracteae 3–5 mm. longae obovatae vel petiolo parvo suborbiculares, foliaceae, ut folia indutae; bracteolae plerumque minutae ovatae; pedicelli brevissimi. Calyx viridis circ. 5 mm. longus in lobos lineari-lanceolatos acuminatos ad costulam dense pilosulos marginibus subscariosos fere ad imum fissus. Corolla ex collectore pallido-flava vel viridi-flava, in sicco intus rubido-maculata, circ. 1 cm. longa, in flore aperto glabra; corollae structura et genitalia cum eis *J. yunnanensis* congruunt. Fructus maturus deest.

"China :—Yunnan, Yangtze valley at Ta-Ku. Lat. 27° 30′

N. Alt. 8000 ft. Dwarf shrub of 9–12 inches. Flowers pale yellow. Dry stony pasture. Aug. 1914." G. Forrest. No. 13,069.

" Yunnan. Mountains in the N.E. of the Yangtze bend. Lat. 27° 45′ N. Alt. 10,000 ft. Dwarf shrubby plant of 3–6 inches. Flowers dull greenish yellow. Open stony pasture. Sept. 1913." G. Forrest. No. 11,004.

Justicia yunnanensis, W. W. Sm. Sp. nov.

Species sectionis Calophanoidis et affinis *J. Neesianae*, Wall. et *J. Championi*, Benth. ; ab *J. quadrifaria*, Wall. sociisque ejus foliis multo minoribus differt ; ab *J. Neesiana*, Wall. caule foliisque pubescentibus inter alia diversa est.

Fruticulus ad 45 cm. altus. Caules basi adscendentes ibique nudi deinde suberecti, nisi ad basem simplices, minute albido-crispato-pilosuli. Folia petiolo 2–5 mm. longo pilosulo suffulta ; lamina circ. 2.5 cm. longa, circ. 1 cm. lata, lanceolata vel oblanceolata, apice obtusiuscula, basi in petiolum anguste cuneata, integra, papyracea, utrinque pilosula. Flores in axillis fere omnibus orientes 4–5-fasciculati ; bracteae 5–10 mm. longae, orbiculari-spathulatae vel obovatae, ut folia indutae, bracteolae lineares vel anguste oblanceolatae ; pedicelli brevissimi. Calyx pallide viridis circ. 5 mm. longus in lobos lineari-lanceolatos acuminatos ad costulam albo-pilosos fere ad imum fissus. Corolla circ. 8 mm. longa pallido-flava extra sparsim pilosula ; corollae forma et lobi et stamina et ovarium cum eis sociorum citatorum congruunt. Fructus glaber ; semina 4 verrucosa.

" China :— Yunnan, in the Yung-pe mountains. Lat. 26° 45′ N. Alt. 10,000 ft. Plant of 9–18 inches. Flowers pale yellow. Dry pasture. Sept. 1913." G. Forrest. No. 11,051.

The five species of *Justicia* described here are all closely allied and form a series somewhat similar to that of *Justicia Neesiana*, Wall. and its allies in Hooker's Flora Brit. Ind., iv (1885), 531. The species are distinguished more by habit and foliage than by the characters of the flower. The size and structure of the corolla, stamens, ovary, and seeds are very much the same in all the species.

Lagotis alutacea, W. W. Sm. Sp. nov.

Species affinis *L. crassifoliae*, Prain et *L. yunnanensi*, W. W. Sm. ; foliis subcoriaceis saepe subintegris, inflorescentiis anguste spicatis, bracteis calycem longe superantibus, calyce corollae tubum subaequante, filamentis staminum antheras vix aequantibus, stigmate vix exserto bene notata.

Planta ad 10 cm. alta glabra. Rhizoma elongatum mediocriter crassum, apice vaginis persistentibus destitutum, radices multas cylindricas emittens. Folia petiolo alato 2–5 cm. longo praedita; lamina 4.5–5.5 cm. longa, 2.5–3.5 cm. lata, late elliptica vel suborbicularis, apice rotundata, basi rotundata vel late cuneata, margine subintegra vel irregulariter (et saepe obscure) dentata, in sicco subcoriacea; folia caulina plerumque duo sub inflorescentiam posita, basilaribus multo minora, ovata vel ovato-lanceolata, sessilia. Scapus folia plerumque paulo superans; inflorescentia circ. 4 cm. longa spicam angustam densifloram formans; bracteae circ. 8 mm. longae, e basi angusta ovatae vel ovato-lanceolatae, obtusae, alutaceae, lurido-virides. Calyx circ. 5 mm. longus, spathaceus, apice bilobus, nervis in lobos excurrentibus. Corollae albae cyaneo-tinctae tubus circ. 5 mm. longus, lobi circ. 4 mm. longi, superior lanceolatus integer, inferiores 2 vel rarius 3 lineares. Antherae filamentis paululo longiores. Stigma vix exsertum. Fructus deest.

"China:—On Ka-gwr-pw, Mekong-Salween divide, Yunnan, in moist open stony pasture. Lat. 28° 30′ N. Alt. 12,000 ft. Plant of 3–4 inches. Flowers white, tinged blue. Aug. 1917." G. Forrest. No. 14,670.

9169 **Var. foliosa,** W. W. Sm.

A typo differt habitu altiore, foliis ellipticis vel ovatis, foliis caulinis conspicuo evolutis, inflorescentiis ad 8 cm. longis, bracteis calycem subaequantibus. An species distincta?

"China:—N.W. flank of the Lichiang Range, Yunnan, on stony moist pasture. Lat. 27° 25′ N. Alt. 12,000 ft. Plant of 6–9 inches. Flowers white flushed rose, bracts blue. July 1914." G. Forrest. No. 12,772.

9177 **Lagotis integra,** W. W. Sm. Sp. nov.

Species habitu *L. glaucae,* Gaertn. var. *Pallasii,* Trautv. sed foliis crassioribus integris, calyce gamophyllo bracteas superante, tubo corollae multo curvato calyce breviore, stylo omnino incluso inter alia differt.

Planta 7–15 cm. alta glabra. Rhizoma elongatum crassum apice nudum radicibus cylindricis bene praeditum. Folia radicalia plerumque 4–5, petiolo 5–9 cm. longo late alato basi vaginato suffulta; lamina 5–7 cm. longa, 2.5–3.5 cm. lata, elliptica vel obovato-elliptica, apice rotundata vel rarius acutata, basi late cuneata, margine integra, in sicco carnosula; caulina 3–4, multo minora, lanceolata, acuta vel acutata, sessilia vel (inferiora) breviter petiolata. Scapus folia longe superans;

inflorescentia spiciformis circ. 6 cm. longa, 1.5 cm. lata ; bracteae herbaceae, infimis majoribus exceptis circ. 4 mm. longae, calyce breviores, lanceolatae, plus minusve acutae. Calyx 6–7 mm. longus, membranaceus, spathaceus, apice breviter fissus, lobis obtusis nervis duobus pererratus, minute erosulus. Corollae cyaneae tubus calyce brevior curvatus et lateraliter extrusus, lobi circ. 3 mm. longi tubo breviores, superior ovato-lanceolatus vulgo integer, inferiores duo lanceolati. Stamina filamentis brevissimis praedita. Stylus ad medium tubum corollinum attingens. Fructus deest.

" China :—On the Bei-ma Shan, Yunnan, on stony pasture. Lat. 28° 12′ N. Alt. 14,000 ft. Plant of 3–6 inches. Flowers deep blue. July 1917." G. Forrest. No. 14,422.

8158 **Lagotis praecox,** W. W. Sm. Sp. nov.

Species nana foliis sub anthesi haud recte evolutis, scapis aphyllis, bracteis parvis corollam staminaque haud celantibus, calyce parvo alte fisso medium tubi corollini paulo excedente, staminibus corollam superantibus inter alia notata ; *L. ramalana*, Batal. valde affinis sepalis duobus acutis ex descriptione differt.

Planta 5–12 cm. alta, glabra. Rhizoma elongatum sat crassum apice squamis persistentibus destitutum radices multas carnosulas emittens. Folia radicalia 2–3, petiolo ad 6 cm. longo alato praedita ; lamina (haud bene evoluta) 2–2.5 cm. longa, 1.5–2 cm. lata, ovata, apice rotundata vel obtusa, basi subrotundata vel cordatula, margine pro magnitudine alte crenata, in sicco papyracea. Scapus sub anthesi folia aequans vel paulo superans, aphyllus, bracteis infimis foliaceis flores gerentibus ; inflorescentia oblongo-globosa circ. 2 cm. longa, 1.5 cm. lata ; bracteae herbaceae, inferiores circ. 8 mm. longae, supra cito decrescentes, corollis (nisi infimis) staminibusque longe exsertis, late obovatae vel subspathulatae apice rotundatae, rarius alte emarginatae. Calyx circ. 3 mm. longus, tenuissime membranaceus, spathaceus, ad medium vel ad tres partes divisus, lobis oblongis obtusis minute fimbriatis. Corollae atro-cyaneae circ. 6 mm. longae tubus limbum paulo superans ; lobus superior oblongus integer vel breviter emarginatus, inferiores vulgo duo elliptici obtusi. Stamina sub anthesi conspicuo exserta, filamentis antheras superantibus, antheris lobos corollinos excedentibus. Stylus paulo exsertus. Fructus deest.

" China :—A-tun-tsu, N.W. Yunnan ; 14,000 ft. May 1911. An Alpine growing on bare gravel and shale screes. It will be noted that the leaves are red and but ill developed, while the flowers are in full bloom. The immense root system is characteristic of these barren-scree plants, partly no doubt on account of the porous nature of the soil and the rapid evaporation from

its surface, partly on account of the frequency with which the soil slides down, especially during heavy rains." F. K. Ward. No. 140.

" China :—Mekong-Salween divide, Yunnan, in open moist pasture. Lat. 28° 20′ N. Alt. 12,000 ft. Plant of 2–5 inches. Flowers deep blue. June 1917." G. Forrest. No. 14,076.

The following probably represents the fruiting stage of *L. praecox*, and a description is appended :—

" China :—On the Bei-ma Shan, Yunnan, in boggy pasture by streams. Lat. 28° 12′ N. Alt. 14,000 ft. Plant of 3–6 inches. Flowers blue. July 1917." G. Forrest. No. 14,404.

Planta ad 15 cm. alta. Folia petiolo 4–7 cm. longo praedita ; lamina 5–7 cm. longa, 4–7 cm. lata, reniformis, apice rotundata, basi cordata vel rotundata, margine crenis sat magnis notata, subcoriacea, infra in sicco purpurascens. Scapus folia subaequans aphyllus. Bracteae (auctae in fructu ?) circ. 1.5 cm. longae, obovatae vel subellipticae, obtusae, subcoriaceae, dense imbricatae florum reliquias celantes. Calyx (ex reliquiis) spathaceus ad tertiam partem bracteae pertinens. Fructus ellipsoideus circ. 7 mm. longus, circ. 3 mm. latus, ad maturitatem uno loculo 1-seminifero, altero subobsoleto.

8170 **Lagotis Wardii,** W. W. Sm. Sp. nov.

Species affinis *L. yunnanensi*, W. W. Sm. a qua foliis latioribus et tenuioribus, inflorescentiis subglobosis, calyce bracteis tuboque corollino breviore recedit.

Planta circ. 15 cm. alta, perennis, glabra. Rhizoma elongatum mediocriter crassum apice nudum, radices multas cylindricas emittens. Folia radicalia petiolo 3–7 cm. longo suffulta ; lamina majorum circ. 6 cm. longa, 4–6 cm. lata, suborbicularis vel ovato-oblonga, apice plerumque rotundata, basi truncato-rotundata vel late cuneata, margine crenis latis paucis notata, in sicco tenuiter papyracea, nervis subdistinctis. Scapus folia aequans vel paululo superans, prope inflorescentiam foliis 1–3 breviter petiolatis vel sessilibus in bracteas transeuntibus praeditus. , Inflorescentia subglobosa 2.5–3 cm. longa, 2.5–3 cm. lata ; bracteae vulgo circ. 1 cm. longae, anguste lanceolatae, apice acutatae, opaco-virides, margine haud albescentes. Calyx sub anthesi bractea multo brevior, circ. 6 mm. longus, spathaceus, nervis in dentes 2 breves excurrentibus, margine saepe minute fimbriatus. Corollae (albae ?) tubus calycem paulo superans, circ. 7 mm. longus, limbus circ. 8 mm. longus, lobo inferiore in lobulos vulgo 2 lineares diviso, superiore lanceolato integro. Antherae subsessiles. Stylus ultra medium tubi corollini vix pertinens, stigmate manifeste bilobato. Fructus deest.

"S.E. Tibet :—At Doker-la, 13,000–14,000 ft. Aug. 1913." F. K. Ward. No. 1043.

Lagotis yunnanensis, W. W. Sm. Sp. nov.

Species ex affinitate *L. glaucae*, Gaertn. a qua rhizomate apice nudo, floribus albis vel roseis, stylo multo breviore tubi corollini medium subaequante inter alia recedit; ab *L. crassifolia*, Prain valde affini foliis apice rotundatis vix carnosis, bracteis vix acutis, lobis corollae tubum fere aequante differt.

Planta circ. 15 cm. alta, ex collectore nonnunquam ad 30 cm., perennis, glabra. Rhizoma elongatum crassum apice nudum radices multas cylindricas carnosulas emittens. Folia radicalia eis *L. glaucae* subsimilia petiolo 6–10 cm. longo suffulta; lamina 3.5–7 cm. longa, 3–5 cm. lata, ovata vel plus minusve elliptica, apice rotundata, basi in petiolum cuneata et decurrens, margine crenis latis notata, in sicco papyracea. Scapus folia superans basi nudus, prope inflorescentiam foliis sessilibus 2–4 in bracteas subtranseuntibus praeditus. Inflorescentia spiciformis circ. 6 cm. longa, 2 cm. lata; bracteae vulgo 7–8 mm. longae, ovatae vel lanceolato-ovatae, apice acutatae sed vix acutae, lurido-virides, margine saepe albido-pergamentaceae. Calyx bracteam sub anthesi paululo excedens, 8–9 mm. longus, spathaceus, nervis in dentes 1–3 excurrentibus, margine saepe minute fimbriatus, albidus. Corollae albae vel roseae tubus calycem fere aequans, limbus 6–7 mm. longus, lobo inferiore in lobulos 2–4 lineares diviso, superiore lanceolato integro vel bilobo. Antherae subsessiles. Stylus ultra medium tubi corollini vix pertinens, stigmate subcapitato. Fructus deest.

"China :—Wa-di-i Shan, Yunnan, on open stony pasture. Lat. 27° 40′ N. Alt. 12,000 ft. Plant of 4–6 inches. Flowers white. Aug. 1917." G. Forrest. No. 15,421.

"Mountains in the N.E. of the Yangtze bend, Yunnan, on open stony pasture. Lat. 27° 45′ N. Alt. 11,000 ft. Plant of 9–12 inches. Flowers rose. July 1913." G. Forrest. No. 10,373.

Parrya linearifolia, W. W. Sm. Sp. nov.

Species affinis *P. eurycarpae*, Maxim. et *P. platycarpae*, Hook. f. et Thoms. a quibus foliis linearibus, calyce fructuque dense albido-piloso inter alia differt.

Planta dense caespitosa fere acaulis. Radix crassa praelonga verticalis multiceps. Caulis brevissimus basi vaginis foliorum vetustorum eorumque vestigiis dense vestitus. Folia dense rosulata, ad 6 cm. longa, 2–4 mm. lata, linearia vel angustissime spathulata, apice obtusiuscula, ad basim vix angustata, sub-membranacea, pilis albidis longiusculis utrinque plus minusve

dense induta. Pedunculi omnes radicales 1-flori, fructiferi ad 5 cm. alti, dense albo-pilosi. Sepala circ. 1 cm. longa, oblonga, obtusa, densissime et longiuscule albo-pilosa, scarioso-marginata. Petala circ. 2 cm. longa rosea, ungue calycem aequante, lamina obovata breviter emarginata vel subintegra minute erosula. Stigma ovario aequilatum. Siliqua 4.5–5.5 cm. longa, 1–1.5 cm. lata, ovato-oblonga, marginibus incrassata, undique plus minusve albo-pilosa ; stigma breviter bilobulum ; semina matura pauca 5–6 late ovalia, multo compressa, circ. 5 mm. longa.

"China :—At A-tun-tsu, N.W. Yunnan. Alt. 15,000 ft. July 1911." F. K. Ward. No. 55.

"China :—Yunnan, in open situations on boulders and cliffs on the Bei-ma-Shan, Mekong-Yangtze divide. Lat. 28° 20′ N. Alt. 14,500 ft. Plant of 3–4 inches. In fruit. Aug. 1914." G. Forrest. No. 13,235.

"Yunnan, on open stony hillsides on the Bei-ma Shan. Lat. 28° 12′ N. Alt. 14,000 ft. Tufted plant of 1–2 inches. Flowers soft rose, fragrant. June 1917." G. Forrest. No. 13,980.

"On the Bei-ma Shan. In immature fruit. July 1917." G. Forrest. No. 14,435.

A species well distinguished by the hairy linear leaves and the hairy ovate-oblong siliqua.

Silene (Melandryum) bilingua, W. W. Sm. Sp. nov.

Species affinis *S. rubicundae,* Franch. et *S. trachyphyllae,* Franch. ; foliis linearibus, petalorum ungue in auriculas latas erosulas flabellatim dilatato, lamina in lobos duos praelongos lineares producta inter alia signa bene notata.

Planta elata ad 60 cm. alta, perennis, satis bene foliosa. Radices numerosae fusiformi-incrassatae, ad caudicem squamis indutae. Caules 1–2, erecti, graciles, ramis subpatentibus ramosi, infra minute et sparsius pilosuli, supra densiuscule glanduloso-pilosuli. Folia basalia non visa ; caulina breviter connata, in petiolum indistinctum attenuata, 2–3 cm. longa, 1–1.5 mm. lata, linearia, apice acuta haud apiculata, membranacea, ad basim minute ciliata, ceteroquin glabra vel subglabra. Inflorescentiae terminales laxae ad 12 cm. longae ad 10 cm. latae, dichotome cymosae, 7–20-florae ; bracteae circ. 1 cm. longae, lineares, ultimae minutae subulatae, omnes glanduloso-pilosulae ; pedicelli inferiores calyce paulo longiores glandulosi. Calyx 10–12 mm. longus, tubuloso-campanulatus, basi paulo constrictus, in sicco purpurascens, ad sixtam partem in lobos triangulares obtusiusculos divisus, extra ad nervos plus minusve glanduloso-pilosulus. Petala circ. 1.5 cm. longa, calycem paulo superantia, pallido-rosea, ungue glabro in auriculas latas bene erosulas flabellatim dilatato et supra subito contracto in limbum

quadratum vix 1 mm. superantem et in linguas duas lineares circ. 3.5 mm. longas abeuntem ; squamae faucis parvae quadratae integrae vel brevissime emarginatae. Staminum filamenta glabra. Ovarium ovatum uniloculare stylis tribus munitum. Capsula vix matura ovato-oblonga gynophoro sextuplo longior.

" China :—Yunnan, on the Bei-ma Shan, amongst rock and scrub by streams. Lat. 28° 12′ N. Alt. 12,000 ft. Plant of 2 ft. Flowers pale rose. July 1917." G. Forrest. No. 14,322.

Silene (Melandryum) chungtienensis, W. W. Sm. Sp. nov.

Species ex affinitate *S. Delavayi,* Franch. et *S. melananthae,* Franch. a quibus habitu elatiore, caulibus floriferis haud infrarosularibus, petalis calycem vix excedentibus breviter bifidis, ungue stylopodioque pilosulis notata.

Planta elata 40–60 cm. alta perennis. Caudex crassiusculus radices fusiformes plures emittens. Caules 1–3, erecti, remotiuscule foliosi, pilis albidis glandulosis plus minusve dense induti. Folia basalia in petiolum vix discretum latum attenuata et subamplexicaulia, cum petiolo ad 9 cm. longa, ad 3 cm. lata ; lamina anguste obovata vel oblanceolata, apice obtusa, margine sub maturitatem eciliata, in sicco papyracea, supra glabra scabridule papillosa, infra levior glabra vel ad nervos minute pilosula ; caulina multo minora sessilia lanceolata vel lineari-lanceolata, longiuscule acutata, utraque pagina et margine pilis glandulosis dense obsita, superne in bracteas bracteolasque lineares glandulosas decrescentia. Inflorescentia elongata cymoso-racemosa laxa circ. 10-flora ; pedicelli calyce plerumque multo breviores dense glandulosi. Calyx 11–12 mm. longus e basi truncata paulo angustata tubuloso-campanulatus, ad tertiam partem in lobos triangulares subacutos dense glandulosos divisus, extra ad nervos distinctos atropurpureos dense glanduloso-pilosulus, intervallis pergamentaceis fere glabris. Petala calycem vix quadrante superantia, saturate rosea, ungue dense pilosulo in auriculas magnas erosulas sensim dilatato et in laminam vix 3 mm. longam subquadratam ad tertiam partem sinu lato divisam abrupte contracto, lobis ovatis apice rotundatis ; squamae faucis breves quadratae integrae vel breviter emarginatae. Staminum filamenta glabra. Ovarium oblongum uniloculare stylis tribus instructum. Capsula ovato-oblonga, gynophoro dense pilosulo triplo longior ; semina reniformia minutissime tuberculata.

" China :—Yunnan, on the Chungtien plateau. Lat. 27° 55′ N. Alt. 12,000 ft. Plant of 16–24 inches. Flowers dull deep rose. Stony pasture. Sept. 1913." G. Forrest. No. 11,270.

This new species is not unlike *S. Delavayi,* Franch., but is

taller; it is easily distinguished from its Chinese relatives by the hairy claw of the petals and the hairy stylopod.

Silene (Melandryum) dumicola, W. W. Sm. Sp. nov.

Species ex affinitate *S. platyphyllae,* Franch. (*Melandryum platyphyllum,* Williams); foliis crasse papyraceis ita perlate ovatis ut nonnunquam suborbicularia videantur, floribus albis margine roseo-tinctis, squamis faucis longis ad laminam corollae mediam attingentibus inter alia bene notata.

Planta elata ad 75 cm. alta, medio et supra ramosa. Radix crassa elongata perennis. Caules plerumque solitarii, in sicco straminei, sat foliosi, erecti, pilis albidis flaccidis plus minusve dense induti. Folia sessilia vel petiolo circ. 2 mm. longo vix discreto praedita; lamina 3–6 cm. longa, 2.5–4.5 cm. lata, late ovata vel ovata, apice subrotundata vel obtusa, breviter apiculata, basi rotundata vel late cuneata, margine pilis rigidis multum asperata, crasse papyracea, in sicco utrinque pallido-viridis, supra undique pilorum basibus incrassatis scabrida, infra pilis vel eorum basibus scabride induta; nervi 2–3 paria subobscuri infra paulo eminentes. Inflorescentia terminalis ad 25 cm. longa, 12 cm. lata, dichotome cymoso-paniculata cymis saepius trifloris; bracteae foliaceae 3–15 mm. longae ovato-lanceolatae vel lanceolatae, pilis glandulosis fulvidis dense praeditae; pedunculi primarii atque secundarii praelongi pilis glandulosis induti; pedicelli ad 1 cm. longi, ut pedunculi vestiti; bracteolae 2–3 mm. longae, lineari-lanceolatae. Calyx 12–14 mm. longus, tubuloso-campanulatus, basi vix constrictus, stramineus in sicco, ad quartam partem vel paulo ultra in lobos ovatos obtusos divisus, extra praesertim ad lobos pilis glandulosis dense indutus, tandem subglabrescens; costae inconspicuae. Petala calycem dimidio superantia, alba, margine pallide rosea, ungue glabro in auriculas fere integras sensim dilatato, et in laminam ovatam ad medium quadripartitam circ. 4 mm. longam expanso, lobis oblongis obtusis medianis majoribus; squamae faucis anguste spathulatae vel lingulatae integrae ad mediam laminam attingentes. Staminum filamenta glabra. Ovarium ovatum uniloculare stylis tribus munitum. Capsula ovato-oblonga gynophoro triplo longior; semina reniformia minute tuberculata.

"China:—Yunnan, on the Yung-pe Mountains. Lat. 27° 45′ N. Alt. 10,000 ft. Plant of 20–30 inches. Flowers white, margined pale rose. In open situations on the margins of thickets. Sept. 1913." G. Forrest. No. 11,229.

Silene (Melandryum) epilosa, W. W. Sm. Sp. nov.

Species inter congeneres yunnanenses habitu altissimo, partibus undique glaberrimis, inflorescentiis praelongis, petalis calyce inclusis bene notata.

Planta elata ad 1.5 m. alta. Radix non visa. Caulis solitarius erectus strictus simplex vel pauciramosus, remotiuscule foliosus glaber. Folia basalia delapsa; caulina in petiolum vix discretum late marginatum attenuata; lamina cum petiolo 6–9 cm. longa, 1–2.2 cm. lata, plus minusve lanceolata, apice acuta breviter apiculata, margine paululo asperata, in sicco papyracea, utrinque glabra minute papillosa: costa media subconspicua; folia superne in bracteas vulgo 1–3 cm. longas lineari-lanceolatas vel lineares decrescentia. Inflorescentia terminalis praelonga ad 60 cm. longa angustissima e cymulis vulgo trifloris racemose dispositis suberectis longiuscule pedunculatis sed tamen internodia haud superantibus composita; pedunculi pedicellique ad 5 cm. longi glabri. Calyx circ. 9 mm. longus e basi paulo angustata tubuloso-campanulatus viridis apice purpurascens, ad quintam partem in lobos ovatos obtusos divisus glaber costis haud conspicuis. Petala vix ad basim loborum calycinorum pertinentia, pallide rosea, ungue glabro in auriculas bene distinctas integras sensim dilatato et in laminam 1 mm longam ad medium partitam exiente, lobis integris; squamae brevissimae lunatae integrae. Staminum filamenta glabra. Ovarium ovato-oblongum uniloculare stylis tribus coronatum. Capsula gynophoro brevissimo praedita seminibus minute tuberculatis.

"China:—Yunnan, at the south end of the Teng-yueh valley. Lat. 25° N. Alt. 6000 ft. Plant of 3–4½ ft. Flowers pale rose. Open limy pasture. July 1912." G. Forrest. No. 8532.

A very tall glabrous species, further distinguished by the small corolla which is included in the calyx. It is not closely allied to any of the described species of Western China.

Silene (Eusilene) esquamata, W. W. Sm. Sp. nov.

Species affinis *S. grandiflorae,* Franch. a qua calycis dentibus rotundatis, ungue exauriculato, squamis faucis deficientibus bene notata.

Planta 30–50 cm. alta, perennis, infra bene foliosa. Radix elongata fusiformi-incrassata. Caules plerumque 2–6, erecti, graciles, ramis erectis substrictis ramosi, ad inflorescentiam paucifoliati, plus minusve albido-pubescentes. Folia basalia emarcida caulinis subsimilia sed longius petiolata; caulina breviter connata, in petiolum latum haud bene discretum attenuata,

2–3.5 cm. longa, 6–11 mm. lata, plerumque oblanceolata, apice breviter acutata et apiculata, basi cuneata, margine minute asperata, membranacea, ad basim albido-ciliolata, ad costam prominulam sparsim pilosula, ceteroquin glabra vel subglabra, nervis obsoletis; superiora multo minora lineari-lanceolata vel linearia, tandem in bracteas lineares vel subulatas circ. 5 mm. longas transeuntia. Inflorescentiae terminales laxe paniculato-cymosae ad 20 cm. longae, ad 12 cm. latae, cymis plerumque trifloris; axes praelongi rigidiusculi, longe subnudi, albo-pilosuli et sparsim glandulosi; pedicelli calyce multo longiores glandulosi. Calyx 17–18 mm. longus, longe clavato-tubulosus, basi paulo angustatus, dentibus rotundatis vel subdeltoideis tantum 1 mm. longis praeditus, in alabastro extra sparsim albo-pilosus, sub anthesin glaber vel subglaber nisi ad nervos plus minusve virides (intervallis albido-pergamentaceis) sparsissime pilosulos et ad dentes extra densissime albo-pilosulos. Petala calycem circ. 8 mm. superantia, rosea, ungue glabro supra sensim dilatato exauriculato, deinde vix contracto, in laminam oblanceo-latam circ. 1 cm. longam ad medium divisam transeunte, lobis oblongis circ. 5 mm. longis apice rotundatis nonnunquam pauci-dentatis; squamae faucis nullae. Staminum filamenta glabra. Ovarium anguste oblongum uniloculare parietum vestigiis in-structum gynophoro brevius stylis tribus praeditum. Capsula ovato-oblonga, alte trilocularis, gynophorum aequans.

"China :—Mekong-Salween divide, Yunnan, in open stony pasture. Lat. 28° 10′ N. Alt. 6000–7000 ft. Plant of 12–20 inches. Flowers rose-pink. August 1917." G. Forrest. No. 14,609.

2677 **Silene grandiflora,** Franch., var. **xerobatica,** W. W. Sm. Var. nov.

A typo habitu nano, foliis linearibus circ. 2 mm. latis, calyce corollaque minoribus recedit. Structura calycis laminaeque corollinae squamarumque cum ea typi congruit. Capsula deest.

"China :—Yunnan, on the Tong Shan in the Yangtze bend. Lat. 27° 20′ N. Alt. 9000 ft. Plant of 6–12 inches. Flowers pale vermilion. Dry stony pasture. Sept. 1913." G. Forrest. No. 10,995.

2678 **Silene (Melandryum) kermesina,** W. W. Sm. Sp. nov.

Species affinis *S. platyphyllae,* Franch. a qua calycis corol-laeque forma longe distat.

Planta elata ad 60 cm. alta, bene foliosa, perennis. Caules 1–3, in sicco straminei, ramosi, erecti, graciles, pilis parvis albidis conspersi. Folia sessilia vel rarius petiolo circ. 1 mm. longo

instructa ; lamina plerumque 3–6 cm. longa, 1–2.5 cm. lata, ovata vel ovato-lanceolata, apice sensim et longiuscule acuminata breviter apiculata, basi rotundata, margine pilis rigidis asperata, tenuiter membranacea, supra minute asperulata, infra pallido-viridis asperulata, utrinque ceteroquin glabra, costa media sparsim pilosula excepta. Inflorescentia terminalis laxa ad 9 cm. longa, ad 12 cm. lata, dichotome cymosa, saepius 7-flora ; bracteae 5–15 mm. longae, foliaceae, lineari-lanceolatae, glanduloso-pilosae ; pedicelli 1–6 cm. longi, pilis glandulosis densiuscule conspersi. Calyx 12–13 mm. longus, tubuloso-campanulatus, basi vix constrictus, in sicco purpurascens, ad quartam partem in lobos triangulares apice in caput membranaceum orbiculare 1 mm. diametro expansos divisus, extra sparsim glanduloso-pilosulus. Petala calycem 5–6 mm. tantum superantia, atro-kermesina, ungue latiusculo mox in auriculas paululo erosulas dilatato et in laminam ovatam ad duas partes quadrifidam 3–4 mm. longam expanso, lobis quadrato-oblongis medianis majoribus ; squamae faucis quadratae parvae integrae. Staminum filamenta glabra. Ovarium ovatum uniloculare stylis tribus ovarium aequantibus munitum. Capsula ovato-oblonga gynophoro quadruplo longior ; semina reniformia minute tuberculata nigrida.

"China :—Yunnan, Kari Pass, Mekong-Yangtze divide. Lat. 27° 40′ N. Alt. 10,000 ft. Plant of 2 ft. Flowers deep lake crimson. Open stony pasture and by streams. Aug. 1914." G. Forrest. No. 12,913.

Silene (Melandryum) lichiangensis, W. W. Sm. Sp. nov.

Species affinis *S. platyphyllae,* Franch. ; foliis basi longe attenuatis fere glabris, ungue petalorum in auriculas latas erosulas dilatato, lamina ad medium partita, squamis denticulatis bene notata.

Planta 20–30 cm. alta perennis. Radices plures anguste fusiformes. Caules plures basi subdecumbentes deinde erecti, pauciramosi, bene foliosi, pilis glandulosis albidis vel rubidis plus minusve dense induti. Folia basalia delapsa ; caulina in petiolum vix discretum latum marginatum longe attenuata superiora subsessilia ; lamina cum petiolo 4–6 cm. longa, 1–1.5 cm. lata, apice longiuscule acutata breviter apiculata, margine minute asperata nonnunquam purpurascentia, membranacea, utrinque glabra vel fere glabra ad insertionem sparsim ciliata, utrinque papillosa. Inflorescentia terminalis dichotome cymosa, plerumque 7-flora ; pedicelli ad 5 cm. longi calycem longe superantes pilis glandulosis rubidis dense obsiti ; bracteae foliaceae 3–15 mm. longae superne decrescentes ovatae vel lanceolatae ad

costam marginesque rubido-glandulosae. Calyx circ. 15 mm. longus e basi truncata paulo angustata tubuloso-campanulatus purpurascens fere ad quartam partem in lobos oblongos obtusos divisus extra fere undique sed praesertim ad nervos pilis glandulosis indutus. Petala calycem quadrante superantia, laete rosea, ungue glabro in auriculas latas crebre erosulas cito dilatato et in laminam basi ovatam circ. 4 mm. longam ad medium partitam abrupte contracto, lobis suborbicularibus apice 2–3-dentatis; squamae faucis breves quadratae 2–3-dentatae. Staminum filamenta glabra. Ovarium ovato-oblongum uniloculare stylopodio triplo longius stylis tribus coronatum. Capsula matura deest.

"China :—Yunnan, on the eastern flank of the Lichiang Range. Lat. 27° 40′ N. Alt. 11,000 ft. Plant of 9–12 inches. Flowers bright carmine. Open situations in pine forests. Aug. 1910." G. Forrest. No. 6305.

Silene (Melandryum) Monbeigii, W. W. Sm. Sp. nov.

Species affinis *S. trachyphyllae*, Franch. a qua habitu humiliore, foliis multo minoribus oblanceolatis obtusiusculis, calycibus multo brevioribus, squamis faucis apice rotundatis inter alia divergit; a *S. rubicunda*, Franch. habitu, foliis, calycis dentibus, lamina petalina haud quadriloba distinguitur.

Planta 15–50 cm. alta perennis. Radix praelonga fusiformi-incrassata. Caules permulti, primo decumbentes deinde erecti, fere a basi ramosi et multum intertexti, graciles, bene foliosi, pilis glandulosis albidis induti. Folia basalia delapsa; folia caulina fere sessilia petiolulo 1 mm. longo late marginato praedita; lamina 1–2 cm. longa, 4–7 mm. lata, oblanceolata vel raro fere obovata, apice obtusa vel breviter acutata minute apiculata, basi in petiolum sensim attenuata, margine ciliolata, membranacea, in sicco utrinque pallido-viridis, utrinque plus minusve pilosula, nervis obscuris; folia superne in bracteas 2–8 mm. longas lanceolatas vel lineares transeuntia. Inflorescentiae ramulos terminantes cymosae 3–7-florae plerumque triflorae; pedicelli ad 1.7 cm. longi dense glanduloso-pilosuli. Calyx 15–16 mm. longus, clavato-tubulosus, basi umbilicatus et paulo angustatus nervis 10 purpurascentibus, fere ad quartam partem in lobos triangulares acutos divisus, extra dense glanduloso-pilosulus. Petala calycem circ. 1 cm. excedentia, rosea, ungue glabro supra sensim dilatato vix auriculato in laminam obovatam circ. 7 mm. longam breviter emarginatam parce erosulam infra medium nonnunquam dentatam expanso; squamae faucis breves ovatae vel semiorbiculares vulgo integrae. Staminum filamenta glabra. Ovarium ovato-oblongum uniloculare stylis tribus praeditum.

Capsula ovato-oblonga gynopodio vix longior seminibus dense et minute tuberculatis.

China :—N.W. Yunnan. Monbeig. No. 37.

"Mekong valley, Yunnan. Lat. 28° 12′ N. Alt. 7000 ft. Plant of 6–20 inches. Flowers pink. Open dry stony situations. July 1917." G. Forrest. No. 14,104.

Silene (Melandryum) oblanceolata, W. W. Sm. Sp. nov.

Species affinis *S. Delavayi*, Franch. et *S. melananthae*, Franch.; a priore pedicellis longioribus, floribus multo minoribus pallidis inter alia divergit ; ab altero foliis oblanceolatis obtusis, floribus haud atropurpureis praeter alia signa recognoscitur.

Planta nana ad 15 cm. alta perennis. Radix fusiformi-incrassata. Caules plerumque 2–4, origine infrarosulares, erecti, simplices vel paucıramosi, sparsim foliosi, pilis albidis glandulosis plus minusve induti. Folia rosulata in petiolum latum marginatum laminam subaequantem attenuata, cum petiolo 4–10 cm. longa, 1–2.5 cm. lata ; lamina oblanceolata, apice vulgo obtusa breviter apiculata, basi sensim cuneata, margine minute ciliata, membranacea, in sicco utrinque pallido-viridis, glabra vel fere glabra, utrinque papillata, costa media straminea, nervis ceteris subobscuris ; folia caulina inferiora pauca basilaribus similia sed breviora, supra mox in bracteas ad 2 cm. longas lanceolatas vel lineari-lanceolatas utrinque glanduloso-pilosas decrescentia. Inflorescentia terminalis subscapiformis laxa dichotome cymosa, plerumque 3–9-flora ; pedicelli 3 cm. longi vel ultra calycem longe superantes dense glanduloso-pilosi ; bracteolae lineares glandulosae. Calyx 12–13 mm. longus, e basi truncata paulo angustata tubuloso-campanulatus, pallido-rubicundus, ad sixtam partem in lobos triangulares obtusiusculos purpurascentes dense glandulosos divisus, extra ad nervos distinctos dense glandulosus, intervallis pergamentaceis fere glabris. Petala calycem quadrante vix superantia, rosea, ungue glabro in auriculas paululo erosulas sensim dilatato et in laminam circ. 4 mm. longam ad duas partes quadrilobam expanso, lobis medianis majoribus oblongis saepe iterum partitis vel denticulatis, exterioribus lineari-oblongis ; squamae faucis breves quadratae apice nonnunquam denticulatae. Staminum filamenta glabra. Ovarium ovato-oblongum uniloculare stylis tribus coronatum. Capsula ovato-oblonga, gynophoro quadruplo longior ; semina reniformia cristis undique ornata.

"China :—Yunnan, on the Mekong-Salween divide. Lat. 28° 10′ N. Alt. 11,000 ft. Plant of 4–6 inches. Flowers pale rose-magenta. Open stony pasture and on the ledges of cliffs. Sept. 1914." G. Forrest. No. 13,331.

The following is closely allied and probably a white form of the preceding :—

"China :—Yunnan, Lichiang Range. Lat. 27° 30′ N. Alt. 10,000 ft. Plant of 2–6 inches. Flowers white. On humus-covered boulders. Aug. 1913." G. Forrest. No. 10,909.

Silene (Melandryum) praticola, W. W. Sm. Sp. nov.

Species ex affinitate *S. dumicolae*, W. W. Sm. a qua foliis acutis vel subacuminatis, inflorescentiis congestis, calycis costis distinctissimis, petalorum lamina aliter fissa inter alia removitur ; a *S. platyphylla*, Franch. petalis albis quadrilobis inter signa alia est divisa.

Planta elata ad 60 cm. alta, simplex vel medio ramosa. Radices plures tuberoso-fusiformes. Caules solitarii, in sicco straminei, sat foliosi, erecti, pilis albidis flaccidis plus minusve dense induti. Folia sessilia vel brevissime petiolata ; lamina plerumque 4–7 cm. longa, 2.5–3.5 cm. lata, ovata, apice acuta vel subacuminata, breviter mucronulata, basi rotundata, margine pilis rigidis asperata, subpapyracea, in sicco utrinque pallido-viridis, supra undique scabrida, infra ad nervos 2–3 paria eminentes pilis asperata, ceteroquin pilosula atque scabridula. Inflorescentia terminalis 5–7 cm. longa, 6–9 cm. lata, congesta, cymoso-corymbosa ; bracteae ovato-lanceolatae vel lanceolatae, foliaceae, ut folia indutae, supra sensim decrescentes ; bracteolae lineari-lanceolatae foliaceae ; pedunculi pedicellique breves rigidi densissime albido- vel fulvido-pilosi ; pedicelli calycem subaequantes vel breviores. Calyx 14–16 mm. longus, tubuloso-campanulatus, basi vix constrictus, in sicco stramineus, ad quartam partem vel paulo ultra divisus, extus ad costas distinctissimas setoso-pilosus, intervallis glabris pergamentaceis ; lobi ovati, marginibus partis superioris ita ventrali-adpressis ut acumen 2 mm. longum formatum sit. Petala calycem triente superantia, alba, roseo-suffusa, ungue in auriculas integras sensim dilatato et in laminam ovatam quadrilobam expanso, lobis medianis multo majoribus oblongis, lateralibus multoties minoribus ; squamae breves quadrato-oblongae integrae. Staminum filamenta glabra. Ovarium ovatum uniloculare stylis tribus instructum. Capsula ovato-oblonga, gynophoro triplo longior ; semina reniformia minute tuberculata, nigra.

"China :—Yunnan, mountains N.W. of Chien-chuan. Lat. 26° 50′ N. Alt. 9000 ft. Plant of 2 ft. Flowers white, flushed rose. Dry stony meadows. July 1914." G. Forrest. No. 13,037.

This species is closely allied to *S. dumicola*, W. W. Sm.,

described above, and is well distinguished by the congested corymbose inflorescence and the entirely different calyx.

Silene (Melandryum) salweenensis, W. W. Sm. Sp. nov.

Species affinis *S. Monbeigii,* W. W. Sm. a qua foliis majoribus obovatis, calyce aliter diviso, corollae lamina aliter secta differt ; a *S. viscidula,* Franch. et *S. langkongensi,* Franch. calycis forma et laminae lobis longe distat.

Planta 40–60 cm. alta. Radix non visa. Caules ut videtur 3–4, primo ascendentes deinde erecti, ramosi vel subsimplices, bene foliosi, infra albido-pubescentes, supra plus minusve glandulosi. Folia caulina breviter connata in petiolum latissimum vix discretum attenuata ; lamina 2–4 cm. longa, 1–2.2 cm. lata, obovata, apice rotundata vel obtusa acumine ipso breviter apiculata, basi late cuneata, margine asperato-ciliolata, membranacea, tactu papillis scabridula, ad costam prominulam infra sparsim pilosula, ceteroquin glabra vel subglabra ; folia superne in bracteas multo minores ovatas vel lanceolatas vel lineares dense glanduloso-pilosulas abeuntia. Inflorescentiae terminales cymosae 7–15-florae ; axes dense glandulosi ; pedicelli inferiores calycem aequantes vel paulo longiores glandulosi. Calyx 12–13 mm. longus, medio circ. 3 mm. latus, anguste tubulosus sed vix clavato-tubulosus, basi umbilicatus et paulo angustatus, nervis 10 viridibus in sicco vix purpurascentibus, ad partem octavam in lobos rotundatos vel obtuse deltoideos purpureo-tinctos divisus, extra sparsiuscule glandulosus. Petala calycem circ. 5 mm. superantia, rosea, ungue glabro supra sensim dilatato in auriculas vix distinctas integras, deinde breviter contracto et in laminam ambitu suborbicularem circ. 3.5 mm. longam quadrilobam transeunte, lobis lateralibus ad dentes reductis, medianis quadrato-oblongis integris, sinu ad mediam laminam pertinente ; squamae faucis parvae vix 0.5 mm. superantes oblongae integrae. Stamina ad medium calycem attingentia filamentis glabris. Ovarium breviter oblongum uniloculare stylis tribus quadruplo longioribus praeditum, gynophoro aequilongum. Capsula ovato-oblonga, gynophoro vix longior sexdentata.

" China :—Mekong-Salween divide, Yunnan, in open situations on the margins of scrub. Lat. 28° 12′ N. Alt. 6000–7000 ft. Plant of 16–24 inches. Flowers rose-pink. Sept. 1917." G. Forrest. No. 14,764.

Sisymbrium yunnanense, W. W. Sm. Sp. nov.

Species ex affinitate *S. Loiselii,* Linn. a quo foliis omnino diversis, seminibus biseriatis inter alia recedit.

Planta ad 1.5 m. alta ut videtur biennis. Caulis crassus sub anthesi glaberrimus albido- vel purpurascenti-glaucus. Folia superiora petiolo 3–10 mm. longo sparsim albo-pilosulo praedita, circ. 10 cm. longa, circ. 3 cm. lata, lanceolata, indivisa, apice plus minusve acuminata, basi in petiolum alatum attenuata, margine remote et minute denticulata, membranacea, supra glabra vel subglabra, infra et ad marginem pilis albidis plus minusve dense conspersa; folia mediana paulo majora basi runcinato-divisa, segmento terminali multo majore, lateralibus paucis parvis; folia ad basim regionis floralis linearia vel linearilanceolata. Inflorescentia racemosa pauciramosa; axis glabra vel subglabra; pedicelli ad 1 cm. longi. Sepala 7–8 mm. longa, oblonga, obtusa, pallide viridia, margine anguste scariosa. Petala 9–10 mm. longa, anguste spathulata, pallido-flava. Siliqua vix matura ad 3.5 cm. longa seminibus biseriatis.

"China:—Mountains in the N.E. of the Yangtze bend, Yunnan, in stony situations amongst scrub. Lat. 27° 45′ N. Alt. 10,000 ft. Plant of 4–5 ft. Flowers pale yellow. July 1913." G. Forrest. No. 10,593.

"On the Bei-ma Shan, Yunnan, in open situations by streams. Lat. 28° 12′ N. Alt. 10,000 ft. Plant of 2–3 ft. Flowers pale yellow. June 1917." G. Forrest. No. 14,016.

4620 **Vaccinium oreotrephes,** W. W. Sm. Sp. nov.

Species ex affinitate *V. viburnoidis*, Rehder et Wilson (mihi non visi); ramulis puberulis, foliis minoribus brevius petiolatis, calycis lobis glabris recedit.

Frutex 30–75 cm. altus ramis crassis; ramuli plus minusve crispato-pilosuli tarde glabrescentes, vetustiores cinerascentes. Folia petiolo crasso 1 mm. longo vel paulo longiore pilosulo praedita; lamina 3–4 mm. longa, 1.5–2 cm. lata, elliptica vel subobovata, apice obtusa vel rotundata, obtuse mucronata, basi late cuneata, denticulis adpressis crenato-serrulata, ad basim subintegra, coriacea, supra subnitenti-viridis ad costam impressam minute pilosula, infra pallidior glabra nervis 4–5 paribus cum costa paulo elevatis. Racemi ad apicem ramulorum congesti, circ. 1 cm. longi, 5–10-flori, glabri vel minute pilosuli; bracteae suborbiculares vel obovatae, 5–7 mm. longae, membranaceae, rubidae, minute ciliolatae, deciduae; bracteolae subellipticae circ. 3 mm. longae, albido-membranaceae, ciliolatae; pedicelli 1–3 mm. longi, glabri. Calyx cum receptaculo circ. 2 mm. longus glaber lobis 0.5–1 mm. longis latissimis marginem undulatum calyci efficientibus. Corolla circ. 6 mm. longa, urceolata, rosea, glabra, ore angusto, lobis minutis recurvis. Stamina filamentis basi dilatatis pilosis 2

mm. longis praedita; antherae 2 mm. longae dorso minute bicalcaratae. Stylus inclusus glaber stigmate anguste capitato. Fructus (in sicco compressus) fere 1 cm. diametro niger seminibus ellipsoideis.

"China :—On the Bei-ma Shan, Yunnan, on open rocky moorland. Lat. 28° 12′ N. Alt. 14,000 ft. Shrub of 2 ft. Flowers rose. July 1917." G. Forrest. No. 14,337.

"Mekong-Salween divide, Yunnan, in open rocky situations amongst dwarf scrub. Lat. 28° 12′ N. Alt. 12,000–13,000 ft. Undershrub of 1–2½ ft. Flowers rose-red. June 1917." G. Forrest. No. 14,067.

"Sept. 1917. Duplicate in fruit; fruits black." G. Forrest. No. 14,830.

This species is closely allied to the Szechuan *V. viburnoides*, Rehder and Wilson, which has been found only once. The Forrestian plant is distinguished by the smaller leaves and eciliate calyx.

U555

Vaccinium taliense, W. W. Sm. Sp. nov.

Species affinis *V. Doniano*, Wight et *S. mekongensi*, W. W. Sm. et *S. salweenensi*, W. W. Sm.; foliis parvis utrinque plus minusve pilosis, pedicellis pilosis, antheris biaristatis inter alia signa bene notata.

Frutex circ. 1 m. altus, ramosissimus, ramulis subtortuosis multo intertextis primo dense pilosulis annotinis glabrescentibus cinerascentibus. Folia petiolo circ. 2 mm. longo dense fulvido- vel albido-pilosulo suffulta; lamina vulgo 2–3 cm. longa, 1–1.5 cm. lata, ovato-lanceolata vel subelliptica, apice acuta vel breviter acuminata, basi rotundata vel late cuneata, margine regulariter atque minute serrulata, membranacea, supra opaco-viridis ad costam dense pilosula ceteroquin sparsim, infra pallidior undique plus minusve dense albido-pilosa, nervis 4–5 paribus subconspicuis. Inflorescentiae racemosae densiflorae; racemi circ. 4 cm. longi dense aggregati ex axillis foliorum delapsorum orientes; rhachis densiuscule pilosula; bracteae et bracteolae 2–3 mm. longae lanceolatae vel lineari-lanceolatae pilosulae cito deciduae; pedicelli circ. 1 mm. longi plus minusve pilosuli. Calyx plus minusve viridis ad lobos rubidus; tubus cum ovario circ. 1.5 mm. longus subglaber; lobi 1 mm. longi triangulares acuti albido-ciliolati. Corolla 5–6 mm. longa urceolata laete rosea extra ad apicem pilosula, intus ad lobos breves minute et sparsim pilosula. Stamina circ. 4 mm. longa filamentis dense albo-pilosulis antheris dorso longe biaristatis. Stylus circ. 5 mm. longus glaber. Fructus deest.

"China :—Western flank of the Tali Range, Yunnan, in

open situations amongst boulders. Alt. 8000–9000 ft. Shrub of 3–4 ft. Flowers bright rose, lined deeper. May 1917." G. Forrest. No. 13,715.

The western side of the Tali Range (from which this species comes) has not been explored botanically to any extent, and must contain many species of interest.

Gesneracearum Novitates.

BY

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THE following novelties are included :—

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Ancylostemon,* Craib, gen. nov.

Calyx ad medium vel ultra medium 5-lobatus, rarius fere ad basem 5-partitus, lobis segmentisve inter se subaequalibus lanceolatis lateve lanceolatis interdum margine denticulatis. Corolla tubulosa, supra medium postice plus minusve ventricosa, ima basi parum gibbosa, limbo e labiis duobus haud patentibus postico 2-lobato vel subintegro antico 3-lobato postico saepissime conspicue longiore constituto. Stamina 4, filamentis infra corollae

* Name derived from *ἀγκύλη* and *στήμων*, suggested by the bend at top of the filaments.

[Notes, R.B.G., Edin., No. LV, November 1919.]

tubi medium insertis rectis sed apice subito inflexis, antheris per paria cohaerentibus rimis longitudinalibus dehiscentibus. Discus conspicuus, pistilli basem laxe cingens. Ovarium superum, lineare, breviter stipitatum, superne in stylum angustatum, stigmate bilobulato, placentis intrusis bilamellatis facie interiore nudis. Capsula linearis vel subclavato-linearis, valvis rectis haud tortis.—Herbae acaules ; folia omnia basalia, saepius dense rosulata, matura distincte petiolata, varie pilosa vel subhirsuta, margine crenulata vel saepius crassius denticulata lobulatave, penninervia, nervis subtus prominentibus. Scapi solitarii vel plures, glanduloso-pilosi, inflorescentiam cymosam umbelliformem plurifloram gerentes, rarius uniflori. Calyx saepissime viridis. Corolla lutea, extra plus minusve glanduloso-pilosa.

1986 **Ancylostemon concavum,** Craib, sp. nov.

Herba acaulis, rhizomate recto saepissime brevi radices numerosas gerente. Folia ut videtur suberecta haud patula, ovata vel oblongo-ovata, apice acuta, basi saepe inaequilateralia, truncata cordatave, usque ad 10 cm. longa et 6 cm. lata, membranacea vel submembranacea, supra iuventute breviter subsericea praetereaque pilis longis brunneis sparse instructa, indumento cito laxiore, subtus indumento simili sed ad costam nervosque laterales densiore tecta, nervis lateralibus utrinque 5–7 intra marginem furcatis supra subconspicuis subtus prominulis, margine dentato-lobulata, lobulis saepissime acutis latere inferiore pauci-serrulatis superiore saepissime integris, interiora brevius petiolata, exteriora petiolo usque ad 11 cm. longo supra saltem superne canaliculato et pilis brevioribus albis divergentibus et pilis longis brunneis tecto suffulta. Pedunculi plures vel sat numerosi, infructescentes folia exteriora vix aequantes, plus minusve rubescentes, indumento ei petiolorum simili sed multo laxius tecti, uniflori vel saepius cymam corymbiformem plurifloram gerentes ; bracteae virides, lineares vel lanceolatae, acutae, ad 1 cm. longae, pilis et brevibus albis et longis brunneis instructae, pedicellis inaequalibus terminalibus ad 3.5 cm. longis. Calyx viridis, extra pilis et brevibus albis et longis brunneis subsparse tectus, sub anthesin campanulatus vel haud rarius oblongo-campanulatus, circa 11 mm. longus, tubo lobis circa duplo longiore, lobis rarius integris saepissime pauci-serrulatis, intra subglaber, post anthesin accrescens, late campanulatus, ad 16 mm. longus, in fructu persistens. Corolla extra pilis longiusculis albis sat dense instructa, intra pilis brevibus albis sparse instructa ; tubus 2 cm. longus, postice superne parum inflatus ; labium posticum 3 mm. longum, basi circa 4.5 mm. latum, lateribus concavum vel subrectum, apice truncatum, brevius bilobulatum, lobulis emarginatis incrassatis, anticum 3-partitum,

segmentis inter se subaequalibus oblongis vel obovato-oblongis 5–7 mm. longis 3.5–4 mm. latis. Stamina antica corollae tubo subaequialta, filamentis circa 14 mm. supra corollae basem insertis, filamentis lateralibus anticis paulo inferius insertis cum anticis glabris; antherarum loculi circa 0.75 mm. longi; stamen posticum ad staminodium 1 mm. longum glabrum circa 8 mm. supra corollae basem insertum redactum. Discus glaber, 3–3.5 mm. altus, inaequaliter 5-lobulatus, lobis apice rotundatis. Ovarium stipite circa 4 mm. longo incluso 1.3 cm. altum, glabrum vel pilis brevibus hic illic instructum, stylo 6 mm. longo, stigmate stylo latiore. Capsula stipite incluso saepissime 4–4.5 cm. longa, calyce styloque vel huius saltem parte inferiore persistentibus.

Yunnan. Mekong-Yangtze divide; Kari Pass, 11,000 ft. Lat. 27° 40′ N. Plant of 4–7 inches. Flowers deep orange. On trunks of trees and moss-covered boulders in shady situations. G. Forrest, 12,943. Flr. et fr. Aug. 1914.

To this species probably also belongs the following plant collected in fruit only :—

Yunnan. Mekong-Salwin divide, 10,000 ft. Lat. 28° 10′ N. Plant of 3–5 inches; in fruit. On trees and rocks in shady situations. G. Forrest, 13,445. Fr. Oct. 1914.

Ancylostemon convexum, Craib, sp. nov.

Herba acaulis, rhizomate perenni brevi radices numerosas emittente. Folia ovato- vel lanceolato-oblonga, rarius ovata, apice acuta, basi late cuneata vel saepe cordatula, usque ad 14 cm. longa et 7.5 cm. lata, membranacea vel chartaceo-membranacea, supra viridia, primo subsericea et pilis longis brunneis instructa, indumento mox multo laxiore, subtus pallidiora, indumento subsimili tecta sed ad costam nervosque laterales brunneo-barbata, nervis lateralibus utrinque 5–8 intra marginem furcatis supra subconspicuis vel fere obscuris subtus prominulis, margine longius brunneo-ciliata, dentato-lobulata, lobulis margine inferiore pauci-serratis superiore saepissime integris, petiolo ad 9 cm. longo pilis longis brunneis lanuginoso et albis breviter pubescente suffulta. Pedunculi saepissime plures, indumento ei petiolorum simili sed multo laxiore tecti, flores saepissime plures in cymam unibelliformem dispositos gerentes, bracteis angustis circa 6 mm. longis, pedicellis inaequalibus ad 2 cm. longis. Calyx viridis, campanulatus vel oblongo-campanulatus, extra pilis et longis brunneis et brevibus albis tectus, circa 7 mm. longus, ad medium lobatus, lobis oblongo-lanceolatis vel oblongo-ovatis apice obtusis subintegris vel saepius pauci-denticulatis trinerviis. Corollae tubus 2 cm. longus, extra subsparse albo-pubescens; labium posticum rotundatum, emarginulatum,

4 mm. longum, 7 mm. latum, anticum ad basem tripartitum, segmentis subellipticis vel ovato-ellipticis lateralibus mediano paulo brevioribus circa 6.5 mm. longis et 4 mm. latis omnibus ciliatis. Antherae anticae corollae tubum paululo superantes, laterales corollae tubum vix aequantes, filamentis omnibus parce pubescentibus, anticis circa 15 mm. supra tubi basem et 3.5 mm. supra lateralia affixis. Discus 1.5 mm. altus, apice 5-lobulatus, glaber. Ovarium circa 9 mm. altum, stipite calyci subaequialto suffultum, stylo 5 mm. longo, stigmate bilobulato. Capsula, stipite incluso, circa 3 cm. longa.

Yunnan. Eastern flank of the Tali Range, 9000–10,000 ft. Lat. 25° 40′ N. Plant of 4–8 inches ; flowers deep ruddy orange. On humus-covered boulders and trees. G. Forrest, 7105. Fl. July 1910.

Ibid. G. Forrest, 4803. Fl. June-July 1906. G. Forrest, 15,483. Fl. et fr. Aug. 1917. G. Forrest, 15,930. Fl. Aug.-Sept. 1917.

Forrest, 4803, was identified by Diels as *Didymocarpus aurea* (Franchet) Diels (*v.* Notes Roy. Bot. Gard. Edin., vii, p. 271). Franchet distinctly states that his species of *Roettlera* have all got 2 stamens only, not 4.

Briggsia,* Craib, gen. nov.

Calyx in segmenta 5 inter se aequalia vel subaequalia saepissime lanceolata conspicue obscureve 3–5-nervia in alabastris aperta partitus. Corolla speciosa, ima basi cylindrica, postice plus minusve gibbosa, deinde antice conspicue inflata et interdum postice etiam sed minus conspicue inflata, bilabiata ; labium posticum 2-lobatum, anticum 3-lobatum, postico longius. Stamina 4, inclusa, antheris per paria cohaerentibus rimis in unam arcuatam mox confluentibus dehiscentibus, filamentis arcuatim inflexis ad corollae tubi basem vel paulo altius affixis ; staminen posticum ad staminodium redactum. Discus conspicuus, cupularis cylindricusve, pistilli basem laxe arcteve cingens. Ovarium superum, basi in stipitem brevem attenuatum, stylo conspicuo, stigmate mediocri bilobulato incluso, placentis bipartitis intrusis facie interiore nudis. Capsula elongata, linearis vel superne paulo ampliata, valvis rectis ; semina minuta, fusiformia.—Herbae acaules, rhizomate crasso, foliis omnibus basalibus, rarius caulescentes, rhizomate tenuiore. Folia simplicia, subsessilia vel distincte petiolata, pilis albis brunneisve

* Named in honour of Munro Briggs Scott, M.A., B.Sc., who fell in the battle of Arras in the spring of 1917. His work as a systematic botanist was only begun, but in his brief tenure of the post of Assistant in the Herbarium attached to the Royal Gardens, Kew, he gave exceptional promise of a very brilliant career.

transverse septatis flaccidis rarius rigidis instructa, vel in speciebus paucis glabra, penninervia, margine varie denticulata vel subintegra. Pedunculi plures, uniflori vel cymam plurifloram umbelliformem gerentes, bracteis conspicuis.

Briggsia Forrestii, Craib, sp. nov.

Herba perennis, acaulis, rhizomate brevi radices numerosas emittente. Folia ut videtur saepissime prostrata, ovato-oblonga, oblonga vel lanceolato-ovata, apice rotundata, rarius obtusa, basi rotundata vel cuneato-rotundata, haud rarius inaequilateralia, usque ad 15 cm. longa et 8 cm. lata, chartacea, supra sicco vel ad costam nervosque laterales albescentia et aliter viridia vel omnino fuscescentia, pilis longis brunneis transverse septatis e pyramide viridi singulatim ortis laxe tecta et pilis brevissimis glanduloso-capitatis hic illic instructa, subtus pallidiora, ad costam nervosque pilis brunneis similibus tecta praetereaque albo-puberula et sparse minuteque glandulosa, nervis lateralibus utrinque 6–8 supra conspicuis vel subconspicuis subtus prominulis, margine subacute vel obtuse denticulata, petiolo usque ad 6 cm. longo supra planiusculo indumento ei foliorum paginae inferioris simili tecto suffulta. Pedunculi communes plures, saepissime circa 12 cm. alti, plus minusve rubescentes, pilis longis brunneis transverse septatis praesertim inferne tecti et albo-puberuli et pilis albis brevibus glanduloso-capitatis instructi, 1–2-flori ; bracteae virides, circa 3 mm. longae ; pedicelli circa 2 cm. longi, glanduloso-pilosuli et saepe pilis paucis longis brunneis instructi. Calyx plus minusve rubescens, dorso pilis longis brunneis transverse septatis sparse tectus et breviter albo-pubescens pilis hic aliis glanduloso-capitatis aliis haud glandulosis, in segmenta 5 lanceolato-oblonga obtusa 5 mm. longa 2 mm. lata ciliata intra setulis paucis instructa fere ad basem partitus. Corollae tubus 3.4 cm. longus, extra praesertim inferne sparse glanduloso-pilosulus ; labium posticum circa 8 mm. longum, 10 mm. latum, bene ultra medium in lobos late oblongos apice emarginatos circa 6 mm. latos imbricatos bifidum, anticum circa 2 cm. longum, vix ad medium 3-lobatum, lobis late ellipticis imbricatis circa 9 mm. latis emarginatis retusisve, lobis omnibus pilis capitatis transverse septatis ciliatis, sinu inter labia lato basi rotundato, labiis ambobus et tubo intra pilis capitatis transverse septatis sparse tectis. Stamina antica lateralia paululo superantia, 4 mm. supra corollae basem et 5.5 mm. infra lateralia inserta, filamentis omnibus subdense glanduloso-pubescentibus, lateralibus anticis paulo tenuioribus ; antherae suborbiculares vel transverse late ellipticae, rimis mox confluentibus, connectivo glabro ; stamen posticum ad staminodium breve circa 3 mm. supra corollae basem insertum redactum.

Discus 1.5 mm. altus, apice undulatus. Ovarium stipite 7–8 mm. longo ovario vix angustiore subglabro incluso 2 cm. longum, pilis capitatis transverse septatis instructum; stylus cum stigmate bipartito 3 mm. longo 9 mm. longus, pilis iis ovarii similibus sed numerosioribus tectus. Capsula stipite incluso 4–5.5 cm. longa.

Yunnan. Shweli-Salwin divide, 10,000 ft. Lat. 25° 30′ N. Plant of 4–7 inches. Flowers pale rosy-purple, lined deeper, with a tinge of yellow on lip. Moist shady moss-covered rocks. G. Forrest, 16,096. Fl. et fr. Sept. 1917.

Ibid. 8000–9000 ft. G. Forrest, 17,552. Fl. et fr. June 1918.

Shweli Valley, 5000–6000 ft. Lat. 24° 50′ N. Plant of 3–6 inches. In fruit. On trees and rocks in shady situations. G. Forrest, 7985. Fr. May 1912.

In the absence of flowers the latter plant, collected in a late fruiting condition, may probably belong to a distinct species, but in its characters it shows a strong resemblance to the flowering specimens of later collecting.

The following plant, represented by inadequate material, agrees with this species in habit and superficial characters:—

Upper Burma. Valley of Naung-chaung. Flowers purple, throat of corolla striped and mottled with white on lower half. On wet rock slabs, in deep shade of forest and gullies or in river bed. Ward, 1888.

1989 **Briggsia longifolia,** Craib, sp. nov.

Herba acaulis, rhizomate brevi radices numerosas rigidas emittente. Folia lanceolata, apice acuta vel subacuta, basi in petiolum attenuata, usque ad 23 cm. longa et 3 cm. lata, rigide chartacea, supra viridia, pilis albis brevibus rigidis marginem versus numerosioribus hirsuta, subtus pallidiora, pilis longioribus praesertim ad costam instructa, praetereaque pagina utraque pilis brevibus glanduloso-capitatis subsparse instructa, nervis lateralibus utrinque 6–8 sat obliquis supra subconspicuis subtus prominulis, costa pagina superiore conspicua inferiore prominente, margine serrulata, ciliata, petiolo lamina decurrente superne anguste alato ad 8 cm. longo pilis albis longiusculis divergentibus tecto praetereaque pilis brevibus glanduloso-capitatis subsparse instructo suffulta. Pedunculi communes plures, folia saepissime subaequantes, 2–5-flori, indumento ei petiolorum simili tecti; bracteae 2, virides, angustae, circa 4 mm. longae; pedicelli sub anthesin saepissime circa 3 cm. longi. Calyx viridis, extra pilis rigidis transverse septatis instructus, intra nisi summum apicem versus glaber, 6.5 mm. longus, in segmenta 5 lanceolata vel oblongo-lanceolata apice acuta 2.5 mm. lata ciliata partitus.

Corolla extra praesertim inferne pilis glanduloso-capitatis subsparse tecta ; tubus circa 22 mm. longus, intra pilis glanduloso-capitatis sparsis instructus ; labium posticum 3 mm. longum, basi 9 mm. latum, ad medium lobatum ; labium anticum circa 10 mm. longum et 12 mm. latum, vix ad medium 3-lobatum, lobis omnibus ciliatis. Stamina antica corollae tubo subaequialta, lateralia paululo superantia ; filamenta glabra, antica circa 2.5 mm. supra corollae tubi basem et 4 mm. infra lateralia inserta ; antherae circa 1.75 mm. longae et 2 mm. latae ; stamen posticum ad staminodium circa 1 mm. longum glabrum circa 3 mm. supra corollae basem insertum redactum. Discus 1.5–1.75 mm. altus, glaber, apice subintiger vel distincte undulato-lobatus. Ovarium stipite brevi incluso 12 mm. longum, glabrum, stylo 4.5 mm. longo pilis glanduloso-capitatis tecto, stigmate bilobato. Capsula, stipite incluso, ad 5 cm. longa.

Yunnan. Western flank of the Shweli-Salwin divide, 10,000 ft. Lat. 25° 20′ N. Plant of 6-12 inches. Flowers deep orange. On ledges of cliffs and on humus-covered boulders. G. Forrest, 8984. Fl. er fr. Aug. 1912. 15,828. Fl. et fr. Aug. 1917.

Shweli-Salwin divide. Lat. 25° 30′ N. Alt. 8000 ft. Plant of 6–10 inches. Flowers yellow, flushed deep purple-crimson at margins. On trees and rocks in shady side valleys. G. Forrest, 17,619. Fl. et fr. July, Aug. 1918.

Briggsia Mairei, Craib, sp. nov.

Rhizoma crassum. Folia omnia basalia, ovata, oblongo-ovata oblongave, apicem versus angustata, basi cordata vel cordatula, usque ad 7 cm. longa et 4.7 cm. lata, chartacea vel rigide chartacea, pagina superiore pilis albis longiusculis transverse septatis laxius tecta, inferiore pallidiora, ad costam nervosque laterales pilis longis brunneis cito agglutinatis obtecta, aliter pilosula, nervis lateralibus utrinque 4–5 subtus prominulis bene intra marginem furcatis, margine grossius dentata vel crenato-dentata, petiolo ad 10 cm. longo pilis longis brunneis cito agglutinatis obtecto suffulta. Pedunculi communes solitarii vel bini, ad 15 cm. alti, pilis longiusculis brunneis transverse septatis instructi, apice bibracteati, bracteis dorso brunneo-barbatis, inflorescentiam umbelliformem paucifloram gerentes ; pedicelli usque ad 3.8 cm. longi. Calyx extra dense brunneo-pilosus, intra glaber, segmentis 5 inter se vix aequalibus lanceolatis vel oblongo-lanceolatis circa 6 mm. longis 1.5–2.5 mm. latis 5-nerviis, nervis intramarginalibus obscuris. Corolla violacea (ex *Maire*), extra basem versus dense brunneo-glanduloso-pilosa, superne pilis multo brevioribus capitatis sparse instructa, intra sparse glanduloso-pilosa, pilis omnibus transverse septatis ; tubus circa 2.8 cm. longus ; labium posticum 5 mm. longum,

bilobulatum, anticum circa 1.5 cm. longum, 3-lobatum, lobis oblongo-rotundatis circa 7.5 mm. longis. Stamina inclusa ; filamenta 4.5–6 mm. supra tubi basem inserta, inferne glanduloso-villosa. Discus circa 2 mm. altus, ob plicas longitudinales primo aspectu 5-partitus, stipitem laxe cingens. Ovarium stipite incluso 1.9 cm. altum, glabrum, stylo 7 mm. longo, stigmate bilobato.—*Didissandra saxatilis*, Lévl., Cat. Pl. Yunnan, p. 123, *non* Hemsl.

Yunnan. Tong-tchouan, 2700 m., Maire, 210, 213, 7455. Fl. Sept. ; ibid., 2600 m., Maire, 285 et sine num. Fl. Oct. Ta-hai, 3000 m., Maire. Fl. July.

Didissandra bhutanica, Craib, sp. nov.

Herba nana, interdum stolonifera. Folia rosulatim disposita, ovato-lanceolata vel elliptica, apice obtusa vel rotundata, basi in petiolum cuneatim angustata, usque ad 20 mm. longa et 13 mm. lata, sed saepissime minora, coriacea, supra viridia, mox nisi ima basi medio glabra, subtus pallidiora, ad costam nervosque laterales dense cinnamomeo-lanuginosa, inter nervos sparse albo- vel brunneo-pilosa, nervis lateralibus utrinque 2–3, supra saepissime impressis subtus prominentibus, margine integra vel subintegra, petiolo circa 13 mm. rarissime ad 20 mm. longo iuventute dense cinnamomeo-lanuginoso suffulta. Pedunculi saepissime plures, uni- vel pluri-flori, floribus umbellatim dispositis, ad 6 cm. alti, pilis longiusculis transverse septatis superne subdense inferne sparse instructi. Calyx fuscus, extra glaber vel subglaber, 5-partitus, segmentis inter se subaequalibus lanceolatis vel lineari-lanceolatis apice obtusis circa 3.5 mm. longis et 1 mm. latis trinerviis. Corollae tubus 7.5 mm. longus, intra antice pilosus, pilis plerisque in lineas duas cum lobis alternantes dispositis ; labium posticum 3.25 mm. longum, ad medium lobatum, lobis oblongis truncatis, anticum fere 5 mm. longum, paulo ultra medium trilobatum, lobis oblongis apice rotundatis. Stamina 4, antheris per paria cohaerentibus, filamentis glabris, antica subinclusa ; stamen posticum ad staminodium parvum redactum. Discus annuliformis. Pistillum calyce subaequialtum, stylo ovario paulo longiore. Capsula ad 16 mm. longa.

Bhutan. Dotena Timpu, 8000 ft., on sloping rock faces. R. E. Cooper, 2508 (type). Tilagong Timpu, 6000 ft., in crevices of rocks. R. E. Cooper, 2437. Chukha Timpu, 4400 ft., in crevices of rocks. R. E. Cooper, 1244.

Didissandra bullata, Craib, sp. nov.

Rhizoma crassum. Folia omnia basalia, matura laxe, iuniora dense rosulatim disposita, patentia, lanceolata, oblanceo-

lata ovatave, apicem versus angustata, summo apice obtusa, basi cuneata, in petiolum angustata, usque ad 3 cm. longa et 1.7 cm. lata, coriacea, supra conspicue bullata, iuventute pilis longis paucis instructa, matura subglabra, subtus ad costam nervosque dense cinnamomeo-lanuginosa, pilis saepe mox agglutinatis, aliter cinnamomeo-pilosa, nervis lateralibus utrinque 3–4 subtus valde prominentibus supra impressis, margine crassius denticulata vel crenato-serrata, matura petiolo ad 2 cm. longo supra parce longe piloso subtus dense cinnamomeo-lanuginoso suffulta. Pedunculi communes ad 7, primo dense cinnamomeo-lanuginosi, demum glabrescentes, ad 9 cm. alti, inflorescentiam multifloram subcongestam umbelliformem gerentes; pedicelli ad 1 cm. longi. Calyx cito glaber, sicco fuscus, in segmenta 5 inter se subaequalia oblonga vel oblongo-lanceolata apice obtusa 3- vel 5-nervia, nervis paulo infra apicem coniunctis, vix 4 mm. longa 1.5 mm. lata partitus. Corollae tubus 9.5–10 mm. longus, intra postice glaber, antice pilis plerisque in lineas duas cum lobis alternantes dispositis instructus, limbo bilabiato, labio postico 2.5 mm. longo bilobato, antico 5.5 mm. longo bene ultra medium 3-lobato lobis oblongis apice rotundatis. Antherae per paria cohaerentes, filamentis glabris, staminibus anticis corollae tubo subaequilongis. Discus annularis. Pistillum calyce paulo longius, stylo apice bilobulato ovario paulo breviore. Capsula fusca, ad 1.6 cm. longa, valvis haud tortis.—*D. lanuginosa*, Lévl., Cat. Pl. Yunnan, p. 123, pro parte, *vix* C. B. Clarke.

Yunnan. Mi-cote à Tong-tchouan, 2600 m., sur les rochers. Fleurs bleu de ciel. E. E. Maire. Fl. July-Aug.

Didissandra Cooperi, Craib, sp. nov.

Herba nana, rosulata, saepe stolonifera; rhizoma superne petiolis persistentibus anni praeteriti densius tectum. Folia densa, ut videtur saltem interiora viva erecta vel suberecta, lanceolata vel oblongo-lanceolata, interdum subspatulata, supra primo plana, mox concava, apice obtusa, basi cuneata, plerumque 5–8 mm. longa, 3–3.5 mm. lata, coriacea, supra viridia, glabra, subtus parum pallidiora, ad costam densius cinnamomeo-lanata, demum senectute albescentia, glabrescentia, costa pagina inferiore inferne prominente, nervis lateralibus utrinque 3 plerumque omnino obscuris interdum senectute subtus subconspicuis, margine saepissime integra, rarissime apicem versus pauci-crenulata, petiolo circa 2.5 mm. longo supra plano primo longius cinnamomeo-lanato demum glabrescente suffulta. Pedunculi communes uniflori, gracillimi, ad 4 cm. longi, primo lanati, cito glabrescentes. Calycis segmenta lineari-lanceolata, obtusa, duo antica aliis paululo longiora, 2 mm. longa, 0.75 mm. lata, glabra, trinervia, nervis plerumque omnino obscuris. Corollae tubus

vix 7 mm. longus, parte basali subcylindrica 1.5 mm. longa, extra glaber, intra antice pilis longiusculis unicellularibus pro parte maxima in lineas duas cum lobis alternantes dispositis lineis loborum bases et vix staminum insertionem attingentibus, pilis paucis infra staminum insertionem vix ad tubi basem additis, postice glaber ; labium anticum ad 5 mm. longum, ultra medium lobatum, lobis oblongis vel obovato-oblongis apice rotundatis ad 3 mm. longis et 2.5 mm. latis, mediano lateralibus paulo longiore, posticum 3 mm. longum, basi 3.75 mm. latum, ad medium lobatum, lobis approximatis basi 1.75 mm. latis. Antherae circa 0.75 mm. longae, apice truncatae, basi emarginulatae ; filamenta antica 2.5 mm. longa, 3.5 mm. supra corollae tubi basem inserta, lateralia 1.75 mm. longa, 2.5 mm. supra corollae tubi basem inserta, omnia glabra ; staminodium circa 0.4 mm. longum, clavatum, glabrum, prope corollae tubi basem insertum. Discus vix 0.25 mm. altus, integer. Ovarium calyce paulo brevius, in stylum 1.5 mm. longum angustatum, glabrum, stigmate emarginato.

Bhutan. Dotena Timpu, 8000 ft. Cooper, 2508/a.

993 **Didissandra cordatula,** Craib, sp. nov.

Herba nana, rhizomate crasso. Folia rosulata, ut videtur viva patula, quoad formam variabilia, plerumque ovata, oblonga vel rarius suborbicularia, apice obtusa vel rotundata, basi rotundata, cordata vel late cuneata, usque ad 3 cm. longa et 2 cm. lata, coriacea, supra sicco fusco-viridia, iuventute pilis longis albidis vel pallide cinnamomeis medio inferne barbata, mox glabra, subtus pallidiora, tantum ad costam nervosque laterales longe cinnamomeo-lanata, aliter glabra, nervis lateralibus utrinque 4–5 cum costa supra subconspicuis vel plerumque plus minusve impressis subtus prominentibus rectis intra marginem furcatis, nervis transversis omnino obscuris, margine ciliata, crenata vel serrato-crenata, exteriora petiolo crasso ad 15 mm. longo indumento nervorum tecto suffulta, interiora sessilia. Pedunculus communis floriferus 8–9 cm. altus, rectus vel inferne arcuato-adscendens, infructescens 11 cm. longus, primo plus minusve cinnamomeo-lanatus, mox glaber, pluriflorus ; pedicelli 8–18 mm. longi, graciles, infructescentes ad 25 mm. longi, indumento pedunculorum. Calycis segmenta oblonga, oblongo-lanceolata vel ovato-lanceolata, apice obtusa, circa 2 mm. longa et 1 mm. lata, intra glabra, extra glabrescentia, 5-nervia, nervis intramarginalibus tenuibus, omnibus infra apicem confluentibus. Corollae tubus 7–8 mm. longus, extra glaber, intra pilis unicellularibus pro parte maxima in lineas duas cum lobis alternantes e loborum basibus fere ad staminum insertionem currentes dispositis perpaucis infra staminum insertionem antice ornatus ;

labium posticum 1.5–1.75 mm. longum, basi 3–3.5 mm. latum, lobis apice rotundatis vel emarginatis 0.75–1 mm. longis, anticum 3–3.5 mm. longum, lobis oblongo-obovatis vel subquadrato-obovatis apice rotundatis ad 2.75 mm. longis et 2.5 mm. latis. Filamenta glabra, antica 4.5 mm. longa, 2.5 mm. supra corollae tubi basem inserta, lateralia 3.25 mm. longa, 2 mm. supra corollae tubi basem inserta; staminodium 0.75 mm. longum, glabrum, circa 0.75 mm. supra corollae tubi basem affixum; antherae apice truncatae, basi emarginulatae. Discus subannularis, circa 0.25 mm. altus. Ovarium calycem paulo superans, glabrum, stylo 4 mm. longo, stigmate emarginato. Capsula 2 cm. longa, calyce diu persistente demum deciduo.

W. Hupeh. Wilson, 2170.

1494 **Didissandra flabellata,** Craib, sp. nov.

Rhizoma crassum, radices fibrosas copiose emittens. Folia omnia basalia, patentia, matura laxa, iuvenilia congesta, obovata vel flabelliformia, rarius subovata, apice rotundata subtruncatave, basi in petiolum cuneatim angustata, usque ad 3.3 cm. longa et 2.5 cm. lata, coriacea, supra viridia, ad nervos glabra, aliter pilis longis sericeis plus minusve persistentibus subcopiose ornata, subtus pallidiora, ad costam nervosque laterales cinnamomeo-lanuginosa, aliter dense sericea, nervis lateralibus utrinque 3–4 bene intra marginem furcatis supra impressis subtus prominentibus, margine crenata, longius albo-ciliata, exteriora petiolo ad 3 cm. longo praesertim lateribus pilis longis sericeis ornato suffulta. Pedunculi rarius solitarii, primo albo-lanati, mox plus minusve glabrescentes, usque ad 12.5 cm. alti. Calyx iuventute sericeus, cito glabrescens, in segmenta 5 inter se subaequalia oblonga vel oblongo-lanceolata apice obtusa 3 mm. longa et 1 mm. lata 3- vel subobscure 5-nervia partitus. Corollae tubus 5.5 mm. longus, intra antice pilis pro parte maxima in lineas duas cum lobis alternantes dispositis densius instructus, limbo bilabiato; labium posticum 2 mm. longum, ultra medium bilobatum, anticum 3–4 mm. longum, ultra medium trilobatum. Filamenta glabra, antheris per paria cohaerentibus. Discus annularis. Ovarium calyci subaequialtum, stylo parum brevius. Capsula straminea, circa 1.2 cm. longa.

Yunnan. Eastern flank of the Tali Range, 8000–10,000 ft. Lat. 25° 40′ N. Plant of 2–6 inches. Flowers dark blue. Faces of cliffs and on humus-covered boulders. G. Forrest, 7129. F. Aug. 1910.

Ibid., 7000–9000 ft. Flowers deep blue or blue and white. Open dry situations on rocks and cliffs. G. Forrest, 4804.

Didissandra grandis, Craib, sp. nov.

Herba perennis; rhizoma crassum, ad 2 cm. diametro, superne petiolorum basibus anni praeteriti persistentibus tectum. Folia rosulata, plana, patula, late lanceolata vel ovato-lanceolata, apicem versus angustata vel rarissime subacuminata, summo apice obtusa, basi late cuneata vel cuneata, in petiolum angustata, usque ad 9 cm. longa et 4.5 cm. lata, valde coriacea, supra glabra, matura saepe siccando atra, subtus dense cinnamomeo-lanata, senectute saepe albicantia, nervis lateralibus utrinque 4–6 cum costa supra impressis subtus valde prominentibus intra marginem furcatis ramis subtus prominentibus, margine integra, saepe incurva, breviter cinnamomeo-lanato-ciliata, petiolo usque ad 5.5 cm. longo valido superne alato supra plano subtus plano-convexo suffulta. Pedunculi plures, arcuato-adscendentes, satis robusti, usque ad 15 cm. alti, dense cinnamomeo-lanati, seniores albo-lanati, pluri- vel multi-flori; pedicelli sub anthesin usque ad 15 mm. longi sed saepissime vix 10 mm. longi, infructescentes paululo elongati, ut pedunculi lanati. Calycis segmenta ovato-lanceolata vel oblonga, apice obtusa, inter se subaequalia, vix 3 mm. longa, 1.25 mm. lata, dorso dense longe cinnamomeo-lanata, intra glabra, margine apicem versus ciliolata, 5-nervia, nervis infra apicem coalitis, intramarginalibus aliis tenuioribus minus distinctis. Corollae tubus 10–11 mm. longus; labium posticum 4 mm. longum, basi 7.5 mm. latum, 2-lobatum, lobis apice rotundatis 2 mm. longis fere 3 mm. latis; labium anticum 6.5 mm. longum, 3-lobatum, lobis circa 5 mm. longis et 4.5 mm. latis elliptico-obovatis apice rotundatis, lobis omnibus pauperrime ciliatis; corolla pilis longiusculis unicellularibus e loborum basibus usque infra staminum insertionem vix in lineas dispositis intus antice instructa, postice omnino glabra. Filamenta glabra, antica 4 mm. longa, 5 mm. supra corollae tubi basem inserta, lateralia 3 mm. longa, 3 mm. supra corollae tubi basem inserta, antheris apice truncatis basi emarginatis; staminodium 1.5 mm. longum, 1.5 mm. supra corollae tubi basem insertum. Discus circa 0.4 mm. altus, integer. Ovarium glabrum, calyce paulo brevius, stylo 2.75 mm. longo, stigmate emarginato. Capsula 15–17 mm. longa, pro longitudine lata, calyce persistente.

Mountains of the Chungtien plateau. Lat. 27° 55′ N. Plant of 4–6 inches. Flowers blue and white. On dry shady rocks, 10,000 ft. Forrest, 10,855.

Kari Pass, Mekong-Yangtze divide. Lat. 27° 40′ N. Plant of 10 inches. Flowers purple-blue and white. Open shady dry rocks, 11,000 ft. Forrest, 12,924.

Didissandra Labordei, Craib, sp. nov.

Rhizoma crassum. Folia omnia basalia, rosulatim disposita, ovato-lanceolata, oblongo-obovata vel elliptico-oblonga, apice obtusa vel rotundata, basi cuneata, usque ad 3.5 cm. longa et 1.8 cm. lata, coriacea, supra viridia, pilis elongatis albis sparse sericea, mox plus minusve glabrescentia, subtus ad costam nervosque laterales dense ferrugineo-lanata, pilis mox agglutinatis, aliter albo- vel mox cinnamomeo-pilosa, nervis lateralibus utrinque circa 4 bene intra marginem furcatis supra impressis subtus valde prominentibus, margine crenata, petiolo ad 2.5 cm. longo indumento ei foliorum simili tecto suffulta. Pedunculi plures, ad 9 cm. alti, pilis paucis longis instructi, fuscescentes; pedicelli circa 1 cm. longi. Calyx extra sub anthesin paucipilosus vel fere glaber, in segmenta 5 lanceolata vel oblongo-lanceolata apice obtusa inter se subaequalia vix 3 mm. longa et 1 mm. lata trinervia vel indistincte 5-nervia nervis infra apicem concurrentibus partitus. Corollae tubus 7 mm. longus, intra antice pilis bilineatim dispositis subsparse instructus; labium posticum 2.5 mm. longum, paululo ultra medium bilobatum, anticum 3.5 mm. longum, 3-partitum, segmentis oblongis apice rotundatis. Antherae per paria cohaerentes. Discus annularis. Ovarium calycem subaequans, stylo ovario paulo longiore, stigmate bilobato. Capsula ad 2.5 cm. longa, valvis rectis.—*D. lanuginosa*, Lévl., Fl. Kouy-Tcheou, p. 182, *vix* Clarke.

Kouy-Tcheou, Tsin-gay. Laborde et Bodinier, 1637 bis. Fl. 11 Sept. 1899.

Didissandra lineata, Craib, sp. nov.

Herba nana, perennis, rhizomate brevi crasso. Folia rosulata, ut videtur viva patula vel plus minusve erecto-patula, lanceolata vel ovato-lanceolata, apice obtusa vel rotundato-obtusa, interdum emarginata, basi cuneata, ad 18 mm. longa et 8 mm. lata, coriacea, supra glabra, mox pallescentia, subtus ad costam nervosque laterales pilis longis plus minusve cinnamomeis subsparse instructa, mox glabra, nervis lateralibus utrinque 2–3 rectis intra marginem furcatis pagina superiore valde impressis inferiore prominentibus, margine crenata, arcte recurva, exteriora petiolo circa 1 cm. longo valido supra planiusculo vel concavo indumento nervorum instructo suffulta, interiora sessilia. Pedunculi communes circa 6–7 cm. alti, pauci- vel pluri-flori, erecti vel inferne arcuato-adscendentes, subglabri, cum pedicellis gracilibus 1–2 cm. longis sub anthesin fusci, demum fructu (anni prioris?) straminei. Calycis segmenta oblonga vel angustius oblonga, apice obtusa, ad 2 mm. longa et 0.75 mm. lata, fusca, glabra, 5-nervia, nervis infra apicem

confluentibus. Corollae tubus 6–6.5 mm. longus, intra pilis longiusculis in lineas duas subdensas e loborum basibus vix ad staminum insertionem currentes dispositis antice instructus, infra staminum insertionem et postice glaber ; labium posticum 2 mm. longum, basi 3.75 mm. latum, lobis apice rotundatis 1.5 mm. longis, anticum 2.5 mm. longum, lobis oblongis vel late oblongis usque ad 1.75 mm. longis et latis apice rotundatis. Filamenta glabra, circa 2.5 mm. supra corollae tubi basem inserta, antica 4 mm. longa, lateralia 2 mm. longa ; staminodium 0.75 mm. longum, circa 1.25 mm. supra corollae tubi basem affixum ; antherae apice truncatae, basi emarginulatae. Discus brevis, integer. Ovarium calyci subaequialtum, glabrum, stylo ad 3.75 mm. longo, stigmate emarginato. Capsula ad 12 mm. longa.

Mountains of the Chungtien plateau. Lat. 27° 55′ N. Plant of 3–4 inches. Flowers deep blue. On dry limestone rocks and cliffs, 10,000 ft. Forrest, 10,790.

1998 **Didissandra lutea,** Craib, sp. nov.

Herba nana, rhizomate brevi crasso. Foliorum rosula 6–12 cm. diametro ; folia oblongo-obovata, obovata vel subrhomboidea, rarius elliptica, apice rotundata, basi in petiolum cuneatim angustata, usque ad 4 cm. longa et 3 cm. lata, coriacea, pagina superiore viridia, medio inferne pilis albis vel pallide cinnamomeis barbata, aliter glabra vel pilis paucis hic illic sparse instructa, inferiore ad costam nervosque cinnamomeo-pannoso-lanata, inter nervos albido- vel cinnamomeo-albido-lanata, nervis lateralibus utrinque 3–4 bene intra marginem furcatis, supra primo bullata, dein nervis parum demum valde impressis, subtus nervis valde prominentibus, margine, parte triente inferiore integra excepta, crenata, petiolo rarius ad 3 cm. longo cinnamomeo-lanato suffulta. Pedunculi communes multiflori, inferne adscendentes, usque ad 10 cm. longi, mox plus minusve glabrescentes sed inferne apiceque pilis longiusculis diu persistentibus ornati ; pedicelli usque ad 15 mm. longi. Calycis segmenta oblongo-ovata, apice rotundata obtusave, ad 2.5 mm. longa et 1.25 mm. lata, 5–9-nervia. Corolla intus pilis longiusculis crassis unicellularibus pro parte maxima in lineas duas e loborum basibus vix ad staminum insertionem currentes dispositis pilis paucis inter et ultra lineas et perpaucis infra staminum insertionem additis antice ornata, postice glabra ; tubus 9 mm. longus ; labium posticum 2.5 mm. longum, basi 6 mm. latum, lobis duobus 1.25 mm. longis, anticum e lobis tribus inter se subaequalibus circa 3 mm. longis et 2.75 mm. latis constitutum. Filamenta glabra, antica 5.5 mm. longa, 2 mm. supra corollae tubi basem inserta, lateralia 4 mm. longa, 1 mm.

supra corollae tubi basem inserta ; staminodium 0.75 mm. longum, circa 0.75 mm. supra corollae basem insertum. Ovarium calyce paulo altius, glabrum, stylo stigmate emarginato incluso 2.5 mm. longo. Capsula vix matura ad 11 mm., stylo persistente excluso, longa.

Bei-ma Shan, Mekong-Yangtze divide. Lat. 28° 30′ N. Plant of 2–5 inches ; flowers pale yellow. On cliffs and boulders in open situations, 11,000–12,000 ft. Fl. Aug. 1914. Forrest, 13,197.

Didissandra mengtzeana, Craib, sp. nov.

Rhizoma breve, radices numerosas fibrosas emittens. Folia omnia basalia, rosulatim disposita, plus minusve flabelliformia, apice rotundata, basi cuneata, usque ad 2.5 cm. longa et 2 cm. lata, coriacea, supra longius sericea, pilis diu persistentibus, subtus densius lanata, nervis lateralibus utrinque 2–3 supra impressis subtus prominentibus, margine crenata, petiolo ad 1.5 cm. vel rarius usque ad 2 cm. longo indumento ei foliorum simili tecto suffulta. Pedunculus communis ad 8.5 cm. altus, primo lanatus, mox plus minusve glabrescens, inflorescentiam pauci- vel pluri-floram congestam vel sublaxam gerens ; pedicelli ad 1 cm. longi. Calyx extra primo lanatus, cito plus minusve glabrescens, in segmenta 5 inter se subaequalia oblonga vel oblongo-lanceolata apice obtusa circa 2 mm. longa vix 1 mm. lata trinervia vel inconspicue 5-nervia nervis infra apicem concurrentibus partitus. Corollae tubus 5 mm. longus, intra antice pilis bilineatim dispositis copiose instructus, postice glaber ; labium posticum 1.5 mm. longum, ultra medium bilobatum, anticum fere 3 mm. longum, trilobatum, lobis oblongis apice rotundatis. Discus annularis. Ovarium calycem subaequans, stylo ovario fere duplo longiore, stigmate bilobulato. Capsula ad 1.5 cm. longa, valvis rectis.

Yunnan. Mengtze, on rocks, 4700 ft., blue flowers. Henry, 9190, et on rocks, also on earthy banks, 4600–5000 ft., purple-blue flowers. Henry, 9190.

Didissandra patens, Craib, sp. nov.

Herba nana ; rhizoma valde crassum. Folia compacte rosulata, patula, exteriora ovato-lanceolata vel oblongo-lanceolata, interiora ovata vel late ovata, summo apice obtusa, basi in petiolum cuneatim attenuata, usque ad 8 cm. longa et 3.7 cm. lata, coriacea, supra viridia, glabra, subtus tantum ad costam nervosque primo breviter cinnamomeo-pannoso-lanata, indumento demum plus minusve albicante vel delapso, aliter glabra, nervis lateralibus utrinque 5–6 cum costa lata supra subcon-

spicuis vel leviter impressis subtus prominentibus rectis bene intra marginem dichotome furcatis, ramis 1–3-furcatis, ramulis omnibus subtus prominentibus, nervis transversis omnino obscuris, margine anguste crenulata, apicem versus praecipue recurva, exteriora petiolo crasso usque ad 5.5 cm. longo indumento nervorum suffulta, interiora sessilia. Pedunculi communes plures, 10–11 cm. alti, inferne arcuato-adscendentes, inflorescentiam corymbiformem laxam multifloram ad 10 cm. diametro gerens, primo plus minusve cinnamomeo-lanati, cito glabrescentes; pedicelli 8–17 mm. longi, cito glabri. Calycis segmenta oblonga vel oblongo-elliptica, apice obtusa, interdum retusiuscula, inter se subaequalia, ad 2.5 mm. longa et 1.5 mm. lata, intra glabra, extra pauci-pilosa, 5-nervia, nervis sub apicem confluentibus, margine superne saepe papillosa. Corolla intus pilis longiusculis unicellularibus pro parte maxima in lineas duas e loborum bases ad filamentorum insertiones vix currentes dispositis, paucis hic et illic inter et ultra lineas et infra staminum insertionem additis antice ornata, postice glabra; tubus 6.5-7 mm. longus; labium posticum vix 2 mm. longum, basi 4.75 mm. latum, lobis duobus 0.75 mm. longis apice rotundatis, anticum 4 mm. longum, 3-lobatum, lobis obovatis vel oblongo-obovatis 2.5 mm. longis 2.75 mm. latis. Filamenta glabra, antica 4 mm. longa, 2.5 mm. supra corollae tubi basem inserta, lateralia 2 mm. longa, 2.25 mm. supra corollae tubi basem inserta, .antheris apice truncatis basi emarginulatis; staminodium 1.5 mm. longum, glabrum, 1.5 mm. supra corollae tubi basem insertum. Discus annularis. Ovarium calyce brevius, glabrum, stylo vix 4 mm. longo, stigmate emarginato. Capsula ad 16 mm. longa, basi calyce persistente arcte cincta.

Mountains in N.E. of Yangtze bend. Lat. 27° 45′ N. Plant of 6 inches. Flowers very pale blue, almost white. Faces of cliffs and boulders, 10,000–11,000 ft. Forrest, 10,698.

2001

Didissandra sericea, Craib, sp. nov.

Herba nana, rhizomate brevi crasso. Folia in rosulam densam 6–16 cm. diametro disposita, oblongo- vel rhombeo- vel lanceolato-ovata, apice rotundata, basi in petiolum cuneatim angustata, usque ad 5.5 cm. longa et 4 cm. lata, coriacea vel subtenuiter coriacea, supra pilis albis longis dense sericea, demum plus minusve glabrescentia sed nequaquam omnino glabra, subtus ad costam nervosque laterales dense cinnamomeo-lanata, aliter subsericea, nervis lateralibus utrinque 3–4 intra marginem furcatis ramulis iterum furcatis supra saepissime impressis subtus valde prominentibus, margine parte triente inferiore cuneata integra excepta crenato-dentata, interiora sessilia, exteriora petiolo usque ad 4 cm. longo cinnamomeo-

lanato suffulta. Pedunculus communis usque ad 15 cm. altus, primo dense albo- vel cinnamomeo-lanatus, mox plus minusve glaber, inflorescentiam multifloram subcongestam gerens; pedicelli usque ad 13 mm. longi. Calycis segmenta plus minusve oblonga, apice rotundata, ad 3 mm. longa et 1.75 mm. lata, 7-nervia. Corolla intus pilis crassis unicellularibus pro parte maxima in lineas duas e loborum basibus vix ad staminum insertionem currentes dispositis paucis inter et ultra lineas et perpaucis infra staminum insertionem additis antice ornata; tubus 8 mm. longus; labium posticum basi 6.4 mm. latum, 3 mm. longum, lobis duobus 1.75 mm. longis apice retusis, anticum trilobatum, lobis apice rotundatis 3–3.5 mm. longis 4 mm. latis. Filamenta antica 5.5 mm. longa, 2.75 mm. supra corollae basem inserta, lateralia 2.5 mm. longa, 2.75 mm. supra corollae basem inserta; staminodium 0.5 mm. longum, 0.75 mm. supra corollae basem insertum. Ovarium calycem vix aequans, stylo stigmate bilobo incluso 5 mm. longo. Capsula ad 2.3 cm. longa, fusca, valvis rectis.

Eastern flank of Lichiang Range. Lat. 27° 30′ N. Plant of 2–6 inches. Flowers blue. On rocks and faces of cliffs, 10,000–12,000 ft. Forrest, 6039.

Eastern flank of Lichiang Range. Lat. 27° 12′ N. Plant of 3–6 inches. Flowers rich blue. Dry open situations on rocks and faces of cliffs, 9000–11,000 ft. Forrest, 2509.

Cult. Hort. Bot. Reg. Edin. ubi floruit June 1919.

Didissandra taliensis, Craib, sp. nov.

Herba nana, stolonifera, rhizomate brevi crasso superne petiolorum vestigiis tecto. Folia spatulata, oblongo-spatulata vel elliptico-spatulata, rarissime ovata, apice rotundata, basi in petiolum attenuata, usque ad 15 mm. longa et 7.5 mm. lata, firme chartacea vel coriaceo-chartacea, supra viridia, glabra, subtus ad costam nervosque rufo-pannoso-tomentosa, aliter glabra et punctulata, nervis lateralibus utrinque 3–4 rectis integris vel intra marginem furcatis, supra omnino obscuris rarissime parum impressis subconspicuis subtus prominentibus, margine superne saepissime crenata, rarius serrato-crenata, rarissime subintegra, parte cuneata basali integra, margine longe pauci-ciliata, mox glabra, plana vel leviter incurva, petiolo usque ad 1 cm. longo superne alato supra plano vel leviter late canaliculato supra glabro subtus indumento costae obtecto suffulta, interiora sessilia. Pedunculi communes plures, 4–5 cm. alti, recti vel inferne arcuato-adscendentes, 1–5-flori, primo plus minusve cinnamomeo-lanati, mox glabri, fusci, pedicellis usque ad 12 mm. longis indumento pedunculi tectis. Calycis segmenta oblonga apice rotundata vel rarius oblongo-lanceolata et apice obtusa, 2.5 mm.

longa, 1–1.25 mm. lata, 5-nervia, nervis infra apicem confluentibus, intra glabra, extra pilis paucis longis primo instructa, cito glabra. Corollae tubus 9–10 mm. longus, extra glaber, intra pilis longis unicellularibus pro parte maxima in lineas duas fere e loborum basibus ad staminum insertionem currentes cum lobis alternantes dispositis paucis infra staminum insertionem positis antice instructus; labium posticum 2–vix 2.5 mm. longum, basi 3.5–4 mm. latum, lobis apice rotundatis vel emarginulatis 1.25 mm. longis, anticum 4–5 mm. longum, lobis obovatis vel obovato-rotundatis apice rotundatis ad 3.75 mm. longis et latis. Filamenta antica 6 mm. longa, lateralia 3 mm. longa, omnia circa 2.75 mm. supra corollae tubi basem inserta, glabra; staminodium 1.25 mm. longum, 1 mm. supra corollae tubi basem insertum. Discus vix 0.5 mm. altus. Ovarium calyci subaequialtum, glabrum, stylo glabro 4 mm. longo, stigmate emarginato. Capsula 15 mm. longa, calyce persistente.

Western flank of Tali Range. Lat. 25° 40′ N. Plant of 1–2½ inches. Flowers deep purplish-blue. On rocks and cliffs in dry situations, 10,000 ft. G. Forrest, 11,536.

2014 forma **robusta,** Craib. Planta multo robustior, foliis duplo majoribus, pedunculis saepe multifloris.

Eastern flank of Tali Range. Lat. 25° 40′ N. Plant of 3–6 inches. Flowers blue, tipped white. On the faces of cliffs and on humus-covered boulders, 8000–10,000 ft. G. Forrest, 6910.

Isometrum, Craib, gen. nov.

Calyx in segmenta 5 inter se subaequalia partitus. Corolla cylindrica, basi postice parum gibbosa, superne haud ventricosa, limbo 5-lobato vix conspicue bilabiato patente lobis inter se subaequalibus rotundatis. Stamina 4, filamentis rectis sed apice subito inflexis corollae tubi basi affixis anticis lateralibus paulo longioribus, antheris per paria cohaerentibus rimis longitudinalibus haud confluentibus dehiscentibus. Discus conspicuus, pistilli basem cingens. Ovarium superum, in stylum ovario paulo brevius angustatum, stigmate bilobato, placentis intrusis bilamellatis facie interiore nudis. Capsulae linearis, valvae rectae, haud tortae. Herbae, rhizomate crasso, foliis omnibus basalibus rosulatim dispositis grosse serrato-crenatis vel lobulatis penninerviis pilis conspicue tectis. Pedunculi foliis moltoties longiores, pilis albis brevibus glanduloso-capitatis et paucis longioribus brunneis instructi, inflorescentiam cymosam umbelliformem bracteatam gerentes.

2003 **Isometrum Farreri,** Craib, sp. nov.

Rhizoma crassum. Folia omnia basalia, rosulatim disposita, obovato-oblanceolata vel anguste ovata, apice obtusa, basi in

petiolum cuneatim angustata vel rotundato-cuneata, ad 3.7 cm. longa et 2 cm. lata, coriacea, pagina superiore pilis albis brevibus plus minusve adpressis subaspera, inferiore pallidiora, pilis similibus sparsius tecta praetereaque ad costam nervosque laterales pilis longioribus brunneis additis, nervis lateralibus utrinque 3–5 intra marginem furcatis supra impressis subtus prominentibus, grosse serrato-crenata vel sublobulata, lobulis apice rotundatis ciliatis; petioli ad 1 cm. longi, pilis longis brunneis primo adpressis mox divaricatis hirsuti. Pedunculi ad 17 cm. alti, rubescentes, plus minusve glandulosi et pilis longioribus brunneis sparse instructi, 5–7-flori, floribus umbellatim dispositis, apice bracteis duabus lineari-lanceolatis circa 5 mm. longis instructi; pedicelli graciles, usque ad 4 cm. longi, indumento ei pedunculi simili tecti. Calyx extra fusco-ruber, in segmenta 5 lineari-lanceolata obtusiuscula circa 4 mm. longa et 1 mm. lata extra glanduloso-pubescentia partitus. Corollae extra praesertim superne sparse glanduloso-pubescentis tubus circa 8.5 mm. longus, postice basi parum gibbosus, limbus e lobis 5 patentibus vix distincte bilabiatim dispositis rotundatis margine irregulariter denticulatis ciliolatis circa 3–4 mm. longis et 4 mm. latis constitutus. Stamina inclusa, filamentis rectis apice subito inflexis, antheris per paria cohaerentibus demum liberis, longitudinaliter dehiscentibus, rimis haud confluentibus. Discus pistilli basem cingens. Ovarium subsessile, glabrum vel superne parce pubescens, calyce parum longius, stylo distincto ovario breviore, stigmate bilobulato.—*Oreocharis Henryana*, Farrer in Journ. Roy. Hort. Soc., xlii, 87 (1916), *non* Oliver.

S. Kansu. Very general at low elevations on rather cool rocks and very steep banks of cool clammy soil that grows a fine film of moss. Flowers a pretty shrimpy pink with a bronzy tone. Farrer et Purdom, 262. Fl. Aug. 28.

2004

Ornithoboea arachnoidea, Craib, comb. nov.

Boca arachnoidea, Diels in Notes Roy. Bot. Gard. Edin., v, p. 225 (1912).

Yunnan. Near Pei sha, Min Kwang valley. Lat. 25° 35′ N. Alt. 6000–7000 ft. Plant of 6–12 inches, growing in clefts of cliffs. G. Forrest, 929! Fr. Oct. 1905. (Type.)

Hills N.E. of Tengyueh. Lat. 25° 15′ N. Alt. 7000 ft. Moist shady situations on humus-covered boulders and ledges of cliffs. Plant of 6–12 inches. Flowers light blue. G. Forrest, 9272! Fl. et Fr. Oct. 1912.

Tengyueh, Howell, 67!

Ornithoboea Darrisii, Craib, comb. nov.

Boea Darrisii, Lévl. in Fedde Rep. Nov. Sp., xi, p. 494 (1913).

Kouy-Tcheou, Esquirol, 730 ! Yuin-li-tcheou, Cavalerie, 3975 !

The type—in fruit only —shows that this species is nearest to *O. Henryi*, Craib. From that species it may be distinguished by the shorter, paler fruits.

Ornithoboea Forrestii, Craib, sp. nov., ab *O. arachnoidea*, Craib, partibus omnibus multo maioribus distinguenda.

Caulis erectus, ad 30 cm. altus, dense cinnamomeo- vel pallide cinnamomeo-arachnoideus. Folia opposita, ovata vel oblongo-lanceolata, apice subacuta, basi inaequilateralia, saepissime cordata, ad 18 cm. longa et 9 cm. lata, membranacea, supra viridia, pilis flaccidis transverse septatis saepe capitatis conspersa, subtus pallidiora, cinnamomeo-arachnoidea, indumento demum plus minusve deciduo, nervis lateralibus utrinque ad 13 saltem superioribus intra marginem anastomosantibus pagina utraque conspicuis vel leviter prominulis, nervulis rete laxum conspicuum vel saepius subconspicuum efficientibus, margine crenulata vel serrulato-crenulata ; petioli usque ad 15 cm. longi, dense cinnamomeo-arachnoidei. Pedunculi solitarii, axillares, circa 3–6 cm. longi, dense cinnamomeo-arachnoidei, apice bracteis duabus linearibus circa 12 mm. longis arachnoideis instructi, inflorescentiam multifloram umbelliformem gerentes, pedunculis partialibus circa 15 mm. longis, pedicellis terminalibus circa 20 mm. longis. Calyx pallidus, in segmenta 5 inter se subaequalia oblonga vel oblongo-ovata apice nervo mediano excurrente breviter apiculata circa 7.5 mm. longa et 3–4 mm. lata pilis transverse septatis longe ciliatis praetereaque sparse rubro-glandulosa partitus. Corollae tubus vix 4 mm. longus ; labium posticum 3 mm. longum, 7 mm. latum, apice 4-undulato-lobulatum, paulo infra apicem linea transversa elevata dense pilosa instructum, anticum 9 mm. longum, trilobatum, lobis 2.5 mm. longis apice rotundatis vel truncato-rotundatis, intra e loborum basibus ad imam basem densissime pilosum. Stamina fertilia duo ; filamenta circa 3 mm. longa, 1.5 mm. supra corollae tubi basem inserta, glabra. Ovarium circa 2 mm. altum, dense glanduloso-pubescens, stylo curvato ovario paulo longiore densius glanduloso-pubescente. Capsula vix matura, 1.7 cm. longa, valvis tortis, stylo persistente coronata, calyce reflexo accrescente persistente.

Yunnan. Shweli-Salwin divide. Lat. 25° 30′ N. Alt. 9000 ft. On shady rocks by streams. Plant of 6–14 inches. Flowers bright blue. G. Forrest, 17,557. Fl. July 1918.

Streptocarpus burmanicus, Craib, species nova *S. orientali*, Craib, habitu persimilis sed calyce multo longiore inter alia facile distinguenda.

Herba erecta, caule terete cum petiolis inflorescentiaque pilis longiusculis transverse septatis glanduloso-capitatis sat dense instructo. Folia superiora opposita, elliptica, ovata obovatave, apice rotundata, basi subaequaliter cuneata vel latere altero acuminata, altero rotundata truncatave, circa 7 cm. longa et 5 cm. lata, chartacea, supra densius breviter flaccido-pilosa, subtus pallidiora, ad costam nervosque laterales dense pilosa, aliter sparse pilosula, nervis lateralibus utrinque circa 4 supra subconspicuis vel conspicuis subtus subprominentibus, margine crassius crenato-serrata, ciliata, petiolo ad 4 cm. longo suffulta. Inflorescentia ei *S. orientalis* similis. Calyx sub anthesin sicco ad 1 cm. longus, dorso pilosus, ad basem usque 5-partitus, segmentis linearibus acutis subconspicue nervatis. Corolla primo subdense pilosa, cito glabrescens, sicco ad 3.5 cm. longa. Capsula ad 5 cm. longa, straminea vel fusco-straminea, valvis tortis.

Upper Burma. Meiktila district. Taunggyigon Reserve, 2200 ft. Mg. Tha Myaing, 262. Fl. et Fr. Oct. 1909.

Dasydesmus, Craib, gen. nov., ab *Oreocharite* corolla tubulosa, antherarum connectivo dorso piloso, disco conspicuo 5-partito distinguenda.

Calyx conspicuus, in segmenta 5 lineari-lanceolata fere ad basem partitus. .Corolla sicco aurantiaca, tubulosa, basi leviter gibbosa ; limbus pro corollae longitudine breviusculus, subdistincte bilabiatus ; labium posticum bilobatum antico trilobato subaequilongum, lobis anticis posticis paulo maioribus. Stamina fertilia 4, filamentis elongatis prope corollae tubi basem affixis ; antherae inclusae vel subinclusae, inter se omnino liberae, lineares, loculis parallelis longitudinaliter dehiscentibus haud confluentibus connectivo dorso piloso ; stamen posticum ad staminodium elongatum redactum. Discus conspicuus, fere ad basem in segmenta 5 oblonga acuminata apicem versus irregulariter pauci-dentata partitus. Ovarium superum, lineare, subsessile, stylo brevi crassiusculo, stigmate bilobulato.—Herba perennis, rhizomate crasso radices fibrosas numerosas emittente, partibus fere omnibus disco ovarioque exclusis pilosa. Folia omnia basalia, distincte petiolata, penninervia, crassius denticulata. Pedunculi communes gemini vel plures, foliis subaequilongi vel iis distincte longiores, inflorescentiam multifloram cymosam umbelliformem subcongestam gerentes ; bracteae elongatae, angustae ; corolla sicco aurantiaca. Species unica chinensis.

Dasydesmus Bodinieri, Craib, comb. nov.

Oreocharis Bodinieri, Lévl. in Bull. Geogr. Bot., No. 304–5, p. 40 (1915).

Rochers—pied du mont Io-chan, 3100 m.; fl. jaune d'ocre, E. E. Maire, 441/1914 et sine num.

Didissandra and Allied Genera in China and N. India.

BY

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COLLECTIONS of herbarium specimens received here of recent years from China, and more especially the large collections made by Mr. Geo. Forrest in S.W. China, show that in *Didissandra* as at present understood there are several very well-marked and easily recognised groups.

The genus *Didissandra* was created by C. B. Clarke * for the reception of plants which, while agreeing in general with *Didymocarpus*, differed from that genus in having four fertile stamens the anthers of which were coherent in pairs. And this definition has more or less held good since that time. No attention whatever was paid to other characters, the result being, as already indicated, that the genus has become at the present time a collection of sharply defined groups. The present paper is the result of an attempt to segregate and define those groups.

In his original account * of the genus Clarke enumerates seven species. Of these six come from the Malayan region and one is recorded from the Himalayas, Khasia, and N. China. In recent years the number of species from the Malayan region has been considerably augmented, and I believe they constitute a group quite distinct from the Himalayan species and, as genera go in Gesneraceae, well worthy generic rank. Since then in my opinion Clarke included more than one genus in his *Didissandra*, it becomes necessary to delimit the genus. For this purpose I have taken as the type of the true *Didissandra* the first species enumerated by Clarke, viz. *D. lanuginosa*.

By taking *D. lanuginosa* as the type of a restricted *Didissandra* and by excluding from it the Malayan lower level species we obtain a very natural series of higher level species, natives of the Himalayas, S.W. China, and Upper Burma. Uniformity in habit is accompanied by several marked characters which enable us to delimit the group very sharply. All are perennial herbs with a thick woody rhizome, with the leaves arranged in basal

* C. B. Clarke in DC. Monog. Phan., v, 65 (1883).

rosette which, in the young stage at least, is nearly always dense. In a few species stolons are present and the flat rosette is somewhat modified. No stem is developed above ground. Each plant bears several peduncles, erect or ascending, sometimes 1-flowered but usually bearing several or many flowers, arranged in a more or less umbelliform manner. Bracts are wanting. The calyx is always divided practically to the base into five segments. The corolla is medium-sized or small, the tube cylindrical, not inflated upwards, and the limb is always bilabiate with the posticous lip shorter than the anticous. Externally the corolla tube is glabrous. Internally the tube is pilose on the anterior side, the hairs, rather thick, being arranged in two rows which alternate with the lobes and which run from the top of the tube to about the insertion of the filaments. And again these hairs arise in groups from tubercled protuberances. Internally on the posterior side the tube is glabrous. The anther cells diverge, the lines of dehiscence becoming soon confluent, their course being at right angles to the filament. After the pollen is shed the anthers are drawn back nearly to the base of the corolla tube by the filaments coiling spirally. The inner face of the placental lamellae is conspicuously hairy—a character well seen in the fruit. The floral characters, and more especially the distribution of the hairs on the inside of the corolla, the structure and method of opening of the anthers and the retracting of the anthers by the spiral coiling of the filaments serve as absolute distinguishing marks of the genus *Didissandra* as understood by me.

The remaining Chinese plants which have been referred to the genus *Didissandra* at various times it is proposed to distribute among three new genera: *Briggsia*, *Ancylostemon*, and *Isometrum*. Characters by which the restricted *Didissandra* may be distinguished from these new genera have already been pointed out.

Of the three new genera *Briggsia* may be easily recognised by the large corolla, ventricose at or just above the middle, and by the gradual inarching of the filaments. In the other two genera the corolla is medium-sized (in *Ancylostemon* slightly ventricose, in *Isometrum* not ventricose), and the filaments are straight throughout practically their whole length, the pairs of anthers being brought into contact by practically a right-angle bend just at the apex of the filament. As regards *Isometrum*, it can be recognised from *Didissandra*, *Briggsia*, and *Ancylostemon* by the spreading corolla limb, which is composed of five almost equal lobes. In the other three genera the limb is most distinctly bilabiate.

Species in cultivation.—Of the species enumerated there are, so far as I am aware, only five in cultivation. *Isometrum Farreri*

was introduced a few years ago by Mr. R. G. Farrer, but unfortunately under a wrong name, viz. *Oreocharis Henryana*. The latter plant is a true *Oreocharis*, *i.e.* the four anthers are free and not coherent in pairs, whereas Farrer's plant has the four anthers cohering in pairs. Farrer collected his plant in S. Kansu.

The remaining four species have been introduced into this country through Mr. George Forrest, who collected seeds of them in Yunnan. The genus *Didissandra* is represented by one species—*D. sericea*, and the genus *Briggsia* by three species—*B. Agnesiae*, *B. longifolia*, and *B. muscicola*. Of these the last two have not yet flowered here. *Didissandra sericea* and *Briggsia Agnesiae* both flowered here this year. The latter is, I think, one of the most charming of the plants of recent introduction.

KEY TO THE GENERA.

Anther cells divergent, dehiscing lines confluent, at right angles to filament ; corolla small to medium-sized, with stoutish unicellular hairs arranged in two more or less well-defined rows alternate with the lobes of the anticous lip and extending well down the tube, glabrous posticously ; anthers finally withdrawn well down the corolla tube by the filaments coiling spirally ; inner surface of placental lamellae conspicuously hairy . . . *Didissandra*.

Anther cells and their lines of dehiscence more or less parallel to the filament ; corolla large to medium-sized ; hairs inside corolla not arranged in rows ; filaments not spirally retracted ; inner face of placental lamellae glabrous or with very few inconspicuous hairs.

Anthers brought into contact by the gradual inarching of the filaments ; corolla tube markedly inflated anticously ; posticous lip distinctly lobed . . . . . *Briggsia*.

Anthers brought into contact by a right-angle bend at apex of filaments ; posticous lip lobed, emarginate or subentire.

Corolla limb distinctly bilabiate, not patent, tube usually slightly inflated about the middle or slightly above the middle . . . . . *Ancylostemon*.

Corolla limb of 5 subequal lobes, only very slightly bilabiate, spreading, tube not inflated . . . . . *Isometrum*.

ENUMERATION OF SPECIES.

Didissandra, C. B. Clarke.

Outer leaves 6–8.5 cm. long, lanceolate to ovate-lanceolate, soon quite glabrous above, nerves 4-6 pair, more or less impressed on the upper surface.

Lower surface of leaf ultimately lanate only on midrib and nerves ; inflorescence soon glabrous . . . . . 1. *patens*.

Lower surface of leaf persistently cinnamomeous or ultimately silvery lanate ; indumentum on peduncle, pedicels and outside of calyx persistent.

Corolla up to 13 mm. long . . . . . 2. *Kingiana*.

Corolla 18 mm. long . . . . . 3. *grandis*.

Leaves not exceeding 5.5 cm. long ; lateral nerves 3–5 pair (mostly 3–4 pair).
Peduncles 1-flowered ; stolons present ; leaves lanceolate to spathulate, 5–8 mm. long, glabrous above, at first cinnamomeo-lanate on nerves below, ultimately glabrous ; nerves mostly obscure on both surfaces . . . . . 4. *Cooperi.*
Peduncles very rarely 1-flowered ; stolons wanting in majority ; leaves at least 1 cm. long ; nerves never obscure on both surfaces, usually impressed above and prominent below.
Leaves glabrous on upper surface or with a few long white hairs more or less persisting on midrib, below densely cinnamomeo-arachnoid or lanate only on the nerves and glabrous or with only an occasional hair on the spaces between the nerves, not closely and deeply plicate.
Stolons present ; leaves spathulate to elliptic or ovate, cuneate at base, usually shallowly and rather distantly crenate-serrate ; nerves obscure or slightly impressed above . . . . . 5. *taliensis.*
Stolons wanting ; leaves elliptic to ovate, cuneate to cordulate at base, crenate ; nerves impressed above. 6. *cordatula.*
Leaves not glabrous on the upper surface, or if glabrous then not glabrous on the lower surface between the nerves or in addition closely and deeply plicate.
Leaf margin entire or subentire.
Leaves up to 20 mm. long and 13 mm. broad, nerves nearly always impressed above ; stolons present ; capsule up to 16 mm. long . . . . . 7. *bhutanica.*
Leaves up to 35 mm. long and 24 mm. broad, nerves rarely impressed above ; stolons wanting ; capsule up to 20 mm. long . . . . . 8. *lanuginosa.*
Leaf margin variously crenate.
Leaves lanceolate to oblanceolate, closely regularly plicate or coarsely and rigidly bullate on upper surface, which is soon glabrescent.
Leaves regularly plicate, peduncle glabrous or glabrescent.
Peduncle quite glabrous ; corolla 1–2 cm. long ; capsule 2 cm. long . . . . . 9. *plicata.*
Peduncle glabrescent ; corolla less than 1 cm. long ; capsule up to 12 mm. long . . . 10. *lineata.*
Leaves coarsely and rigidly bullate above ; peduncle even in fruit more or less cinnamomeo-lanate 11. *bullata.*
Leaves not lanceolate, or if approaching lanceolate then not glabrous above, not closely plicate or bullate above.
Corolla yellow ; leaves obovate to obovate-spathulate, soon glabrescent above unless towards the base . 12. *lutea.*
Corolla blue, blue and white, or white.
Leaves persistently sericeous above.
Corolla tube over 7 mm. long ; leaves oblong- to lanceolate-ovate . . . . . 13. *sericea.*
Corolla tube under 6 mm. long ; leaves tending to flabelliform.
Corolla tube not densely barbate anticously at apex ; peduncle not glabrous at flowering time . . . . . 14. *flabellata.*

Corolla tube densely barbate anticously at apex; peduncle nearly glabrous at flowering time . . . . . 15. *mengtzeana.*

Leaves more or less glabrescent, never sericeous at maturity . . . . . 16. *Labordei.*

1. **D. patens,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 247 (1919).

Yunnan. Mountains in N.E. of Yangtze bend. Lat. 27° 45′ N. Faces of cliffs and boulders, 10,000–11,000 ft. Plant of 6 inches. Flowers very pale blue, almost white. G. Forrest, 10,698! Fl. et Fr. Aug. 1913.

2. **D. Kingiana,** Craib, nom. nov.

D. rufa, King ex Hook. f. in Hook., Ic. Pl., t. 1437; C. B. Clarke in Hook. f., Fl. Brit. Ind., iv, p. 355, *non* C. B. Clarke in DC. Monog. Phan.

E. Tibet. Chumbi, 12,000 ft. King's Collector.

3. **D. grandis,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 244 (1919).

Yunnan. Mountains of the Chungtien plateau. Lat. 27° 55′ N. Alt. 10,000 ft. On dry shady rocks. Flowers blue and white. G. Forrest, 10,855! Fl. Aug. 1913.

Mekong-Yangtze divide, Kari Pass. Lat. 27° 40′ N. Alt. 11,000 ft. Open shady dry rocks. Plant of 10 inches. Flowers purple-blue and white. G. Forrest, 12,924! Fl. Aug. 1914.

The three species enumerated above form a well-marked group easily recognised from all the other species by their large leaves.

4. **D. Cooperi,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 241 (1919).

D. lanuginosa, C. B. Clarke in Hook. f., Fl. Brit. Ind., iv, p. 355, quoad pl. bhutanicam.

Bhutan. Dotena Timpu, 8000 ft., Cooper, 2508/a! Bhutan, Griffith, K.D. 3835! pro parte.

5. **D. taliensis,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 249 (1919).

Yunnan. Western flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000 ft. On rocks and cliffs in dry situations. Flowers deep purplish-blue. G. Forrest, 11,536! Fl. Aug. 1913.

forma **robusta,** Craib, l.c., p. 250.

Yunnan. Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8000–10,000 ft. On the faces of cliffs and on humus-covered boulders. Plant of 3–6 inches. Flowers blue, tipped white. G. Forrest, 6910! Fl. Aug. 1910.

6. **D. cordatula,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 242 (1919).
W. Hupeh, Wilson, 2170 ! Fl. et Fr. June 1900.

7. **D. bhutanica,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 240 (1919).
Bhutan. Tilagong Timpu, in crevices of rock, 6000 ft., R. E. Cooper, 2637 ! Dotena Timpu, on sloping rock faces, 8000 ft., flowers blue, R. E. Cooper, 2508 ! Chukha Timpu, in crevices of rock, 4400 ft., flowers blue, R. E. Cooper, 1244 !

8. **D. lanuginosa,** C. B. Clarke in DC. Monog. Phan., v, p. 66 (1883), pro parte ; id. in Hook. f., Fl. Brit. Ind., iv, p. 355, pro parte.
Didymocarpus lanuginosa, Wall. ex DC. Prodr., ix, p. 268 ; C. B. Clarke, Comm. et Cyrt. Beng., t. 67, saltem pro parte.
N.W. Himalaya. Kumaon, below Naini, 4500 ft., damp rocks, J. R. Reid ! Bashahr, Manglad Valley, 5000 ft., Lace, 1057 ! Ushan Valley, 4500 ft., G. Watt !
I have seen no specimens except from the Himalayas which I can refer to true *D. lanuginosa.*

9. **D. plicata,** Franchet in Bull. Soc. Linn. Par., n.s. i, p. 123 (1899).
Yunnan. Tapintze, Mt. Ma-eul-chan, above Hokim-tcheou, 2500 m., in fissures of limestone. Delavay, 3837.

10. **D. lineata,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 245 (1919).
Yunnan. Mountains of the Chungtien plateau. Lat. 27° 55′ N. Alt. 10,000 ft. On dry limestone rocks and cliffs. Plant of 3–4 inches. Flowers deep blue. G. Forrest, 10,790 ! Fl. et Fr. Aug. 1913.

11. **D. bullata,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 240 (1919).
D. lanuginosa, Lévl., Cat. Pl. Yunnan, p. 123, pro parte, *vix* C. B. Clarke.
Yunnan. Tong-tchouan, 2600 m., Maire ! Fl. July-Aug. Ma-ngau-chan, on rocks, 2550 m., Maire, 212 ! 214 !

12. **D. lutea,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 246 (1919).
Yunnan. Bei-ma Shan, Mekong-Yangtze divide. Lat. 28° 30′ N. Alt. 11,000–12,000 ft. On cliffs and boulders in open situations. Plant of 2–5 inches. Flowers pale yellow. G. Forrest, 13,197 ! Fl. Aug. 1914.

13. **D. sericea,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 248 (1919).

Yunnan. Eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 10,000–12,000 ft. On rocks and faces of cliffs. Plant of 2–6 inches. Flowers blue. G. Forrest, 6039! Fl. et Fr. June 1910.

Eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9000–11,000 ft. Dry open situations on rocks and faces of cliffs. Plant of 3–6 inches. Flowers rich blue. G. Forrest, 2509! Fl. July 1906.

Cult. Hort. Bot. Reg. Edin. ubi floruit June 1919!

14. **D. flabellata,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 243 (1919).

D. lanuginosa, C. B. Clarke, var. *flabellata,* Franchet ex Diels in Notes Roy. Bot. Gard. Edin., vii, p. 271.

Yunnan. Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8000–10,000 ft. Faces of cliffs and on humus-covered boulders. Plant of 2–6 inches. Flowers dark blue. G. Forrest, 7129! Fl. Aug. 1910.

Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7000–9000 ft. Open dry situations on rocks and cliffs. Plant of 2–6 inches. Flowers deep blue or blue and white. G. Forrest, 4804! Fl. June-Sept. 1906.

15. **D. mengtzeana,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 247 (1919).

Yunnan. Mengtze, on rocks, 4700 ft., blue flowers, Henry, 9190! et on rocks, also on earthy banks, 4600–5000 ft., purple-blue flowers, Henry, 9190!

16. **D. Labordei,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 245 (1919).

D. lanuginosa, Lévl., Fl. du Kouy-Tcheou, p. 182, *vix* C. B. Clarke.

Kouy-Tcheou. Tsin-gay, Laborde et Bodinier, 1637 bis! Gan-pin, Martin et Bodinier, 1637! Gan chouen, Cavalerie, 3121!

Briggsia, Craib.

Leaves glabrous or in the young stage puberulous, narrowly peltate; acaulescent.
- Calyx segments 9 mm. long; corolla 5–6 cm. long . . 1. *longipes.*
- Calyx segments up to 7 mm. long.
  - Corolla 5 cm. long . . . . . 2. *Mihieri.*
  - Corolla up to 3.5 cm. long . . . . . 3. *Fritschii.*

Leaves never glabrous.
- Distinct stem present.
  - Leaf margin serrate, undersurface with few scattered hairs on midrib and nerves; calyx 1 cm. or more long . 4. *amabilis.*

Leaf margin crenulate, undersurface puberulous with mostly capitate hairs ; calyx about 6 mm. long . 5. *Cavaleriei.*

Stemless.

Corolla with a spur-like projection on the inside near the base of each of the anticous filaments . . . 6. *Agnesiae.*

Corolla without such appendages .

Corolla lobes denticulate at the apex . . 7. *pinfaensis.*

Corolla lobes not denticulate.

Leaf margin entire . . . . 8. *Beauverdiana.*

Leaf margin not entire.

Leaves elongate, lanceolate to oblong-spathulate.

Corolla 5 cm. long . . . . . 9. *speciosa.*

Corolla up to 3.5 cm. long

Leaf indumentum consisting of white hairs 10. *longifolia.*

Undersurface of leaf with both white and brown hairs . . . . . 11. *muscicola.*

Leaves oblong, elliptic or ovate.

Petiole shorter than lamina ; hairs on upper surface of leaf arising from cushion-like projections . . . . . 12. *Forrestii.*

Petiole at least of outer leaves longer than the lamina ; hairs on upper surface of leaf not on such projections.

Leaves cordulate at base . . . 13. *Mairei.*

Leaves cuneate at base . . 14. *elegantissima.*

1. **B. longipes,** Craib, comb. nov.

Didissandra longipes, Hemsl. ex Oliver in Hook., Ic. Pl., t. 2379 (1895) ; Hemsl. in Kew Bull., 1895, p. 115 ; Lévl., Cat. Pl. Yunnan, p. 123.

Yunnan. Mengtze, in crevices of shady rocks in a dark limestone glen. Hancock, 50.

2. **B. Mihieri,** Craib, comb. nov.

Didissandra Mihieri, Franchet in Bull. Mens. Soc. Linn. Par., 1885, p. 450 ; Lévl., Fl. Kouy-Tcheou, p. 182, pro parte.

Didymocarpus Mihieri, Lévl. in Compte Rend. Ass. Fr. (1905), 1906, p. 427.

Kouy-Tcheou, Perry, 1858 ; Gan-pin, Martin et Bodinier, 1816 ! Fl. 17–20 Sept.

3. **B. Fritschii,** Craib, comb. nov.

Didissandra Fritschii, Lévl. et Van. in Compte Rend. Ass. Fr. (1905), 1906, p. 425.

D. Mihieri, Lévl., Fl. Kouy-Tcheou, p. 182, pro parte.

Chirita Fauriei, Lévl., l.c., p. 181, pro parte, *vix* Franchet.

Didymocarpus Fritschii, Lévl. in Compte Rend. Ass. Fr. (1905), 1906, p. 428.

Kouy-Tcheou, Esquirol, 583 ! Tsin-gay, Laborde et Bodinier, 2464 !

In his Flore du Kouy-Tcheou Léveillé reduced his *Didissandra Fritschii* to Franchet's earlier species *D. Mihieri*. Little more than the types is known of these two species, and they differ so markedly in floral dimensions that for the present I prefer to enumerate them as distinct.

4. **B. amabilis,** Craib, comb. nov.

Didissandra amabilis, Diels in Notes Roy. Bot. Gard. Edin., v, p. 224 (1912), pro parte ; Lévl., Cat. Pl. Yunnan, p. 123.

Yunnan. Eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10,000–11,000 ft. Moist moss-covered ledges and crevices of cliffs. Plant of 6–9 inches. Flowers light yellow, spotted purple. G. Forrest, 2689 ! Fl. Aug. 1906.

var. **taliensis,** Craib, var. nov., corolla paulo breviore latiore aurantiaco- vel aurantiaco-brunneo-maculata, caulis indumento sparsiore, foliis tenuioribus cognoscenda.

Didissandra amabilis, Diels in Notes Roy. Bot. Gard. Edin., v, p. 224 (1912), pro parte.

Yunnan. Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000–10,000 ft. On trees and humus-covered boulders in shady situations in side valleys. Plant of 6–12 inches. Flowers orange-yellow, spotted orange-brown. G. Forrest, 4385 ! Fl. July-Aug. 1906.

Ibid. Flowers deep yellow, spotted orange. G. Forrest, 6893 ! Fl. July 1910.

5. **B. Cavaleriei,** Craib, comb. nov.

Didissandra Cavaleriei, Lévl. et Van. in Compte Rend. Ass. Fr. (1905), 1906, p. 425.

Chirita sphagnicola, Lévl., Fl. Kouy-Tcheou, p. 182, quoad spec. infra citatum, *haud* Lévl. et Van.

Didymocarpus Cavaleriei, Lévl. in Compte Rend. Ass. Fr. (1905), 1906, p. 427.

Kouy-Tcheou, Esquirol, 646 ! Fl. Aug. 1905 ; Pin-Fa, Cavalerie, 239 ! Fl. Aug. 1902.

Léveillé in his Flore du Kouy-Tcheou reduced his *Didissandra Cavaleriei*, which is a true *Didissandra* (in the wide sense), to *Chirita sphagnicola*, which is a true *Chirita*.

6. **B. Agnesiae,** Craib, comb. nov.

Didissandra Agnesiae, G. Forrest in Notes Roy. Bot. Gard. Edin., viii, p. 334 (1915) ; Lévl., Cat. Pl. Yunnan, p. 123.

Yunnan. Mountains of the Yung Peh. Lat. 26° 40′ N. Alt. 9000–10,000 ft. Plant of 2–4 inches. Flowers deep crimson.

Open dry situations on rocks and cliffs. G. Forrest, 12,829! Fl. July 1914.

Cult. Hort. Bot. Reg. Edin. ubi floruit July 1919!

7. **B. pinfaensis,** Craib, comb. nov.

Didissandra pinfaensis, Lévl. in Fedde Rep. Nov. Sp., ix, 328 (1911).

D. elegantissima, Lévl., Fl. Kouy-Tcheou, p. 182, quoad syn. *vix* Lévl. et Van.

Kouy-Tcheou, Pin-Fa, Cavalerie, 3315!

8. **B. Beauverdiana,** Craib, comb. nov.

Didissandra Beauverdiana, Lévl. in Fedde Rep. Nov. Sp., ix, p. 328 (1911); Lévl., Cat. Pl. Yunnan, p. 123.

Yunnan. Tchen-Fong-Chan, Delavay, 5029, 5085.

9. **B. speciosa,** Craib, comb. nov.

Didissandra speciosa, Hemsl. in Journ. Linn. Soc., xxvi, p. 228 (1890).

Didymocarpus speciosa, Lévl. in Compte Rend. Ass. Fr. (1905), 1906, p. 428.

Hupeh. Patung, Nanto, Hsingshan, and Tunghu, mostly on faces of perpendicular cliffs. Henry.

10. **B. longifolia,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 238 (1919).

Yunnan. Western flank of the Shweli-Salwin divide. Lat. 25° 20′ N. Alt. 10,000 ft. Plant of 6–12 inches. Flowers deep orange. On ledges of cliffs and on humus-covered boulders. G. Forrest, 8984! Fl. et Fr. Aug. 1912. G. Forrest, 15,828! Fl. et Fr. Aug. 1917.

Shweli-Salwin divide. Lat. 25° 30′ N. Alt. 8000 ft. On trees and rocks in shady side valleys. Plant of 6–10 inches. Flowers yellow, flushed deep purple-crimson at margins. G. Forrest, 17,619! Fl. et Fr. July-Aug. 1918.

Shweli-Salwin divide. Lat. 25° 20′ N. Alt. 9000 ft. Shady dry situations on rocks and in thickets. Flowers deep yellow with darker markings. G. Forrest, 11,988! Fl. Aug. 1913.

11. **B. muscicola,** Craib, comb. nov.

Didissandra muscicola, Diels in Notes Roy. Bot. Gard. Edin., v, p. 225 (1912).

Yunnan. Mekong-Salwin divide. Lat. 27° 30′ N. Alt. 7000–8000 ft. On moss-covered boulders and trees in shady

rhododendron forest, in side valleys of the Mekong. Plant of 6–12 inches. Flowers deep orange. G. Forrest, 5095! Fl. et Fr. July 1905.

Mekong-Salwin divide. Lat. 28° 12′ N. Alt. 10,000 ft. Shady situations on rocks and trees in side valleys. Plant of 12 inches. Flowers pale orange-yellow with brown markings. G. Forrest, 14,189! Fl. and Fr. July 1917. G. Forrest, 14,967! Fr. Sept. 1917.

Mekong-Salwin divide. Doker La. Lat. 28° 20′ N. Alt. 10,000 ft. In shady forests, on trunks of trees. Plant of 6–10 inches. Flowers deep orange, spotted dull purple. G. Forrest, 16,879! Fl. Aug. 1918. G. Forrest, 17,262! Fr. Oct. 1918.

12. **B. Forrestii,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 237 (1919).

Yunnan. Shweli-Salwin divide. Lat. 25° 30′ N. Alt. 8000–10,000 ft. Moist shady moss-covered rocks. Plant of 4–7 inches. Flowers pale rosy-purple, lined deeper, with a tinge of yellow on lip. G. Forrest, 16,096! Fl. et Fr. Sept. 1917. G. Forrest, 17,552! Fl. et Fr. June 1918.

Shweli Valley. Lat. 24° 50′ N. Alt. 5000–6000 ft. On trees and rocks in shady situations. Plant of 3–6 inches. G. Forrest, 7985! Fr. May 1912.

To this species may also belong Ward, 1888, from Upper Burma. Flrs. purple, throat of corolla striped and mottled with white on lower half. On wet rock slabs, in deep shade of forest and gullies or in river bed. Valley of Naung-chaung.

13. **B. Mairei,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 239 (1919).

Didissandra saxatilis, Lévl., Cat. Pl. Yunnan, p. 123, et fig. 26, p. 124, *non* Hemsl.

Yunnan. Tong-tchouan, 2600–2700 m., Maire, 210! 213! 285! 7455! et sine num.! Ta-hai, 3000 m., Maire!

14. **B. elegantissima,** Craib, comb. nov.

Didissandra elegantissima, Lévl. et Van. in Compte Rend. Ass. Fr. (1905), 1906, p. 425; Lévl., Fl. Kouy-Tcheou, p. 182, excl. syn.

Didymocarpus elegantissima, Lévl. in Compte Rend. Ass. Fr. (1905), 1906, p. 428.

Kouy-Tcheou, Pin-Fa, Cavalerie, 239! Ton-chan, Cavalerie, 2686!

Under number 2686 are two specimens, on each of which

there is only one open flower. In the dry state these two corollas differ considerably in the length of the posticous lip—the corolla of the smaller plant has a much shorter posticous lip than that of the larger.

Ancylostemon, Craib.

Peduncles cinnamomeo-lanate, midrib and nerves on undersurface of leaves densely cinnamomeo-lanate, the hairs soon becoming agglutinated . . . . . 1. *notochlaena.*
Peduncles as also midrib and nerves of undersurface of leaf with long spreading brown hairs (in addition to shorter pale ones).
  Ovary densely covered with short hairs . . . 2. *saxatile.*
  Ovary glabrous or with a few scattered hairs.
    Calyx at flowering time 11 mm. long ; posticous lip of corolla with concave or straight sides, thickened at apex and slightly lobulate . . . . . 3. *concavum.*
    Calyx at flowering time not over 7 mm. long ; posticous lip subentire, emarginate or distinctly lobed, not thickened at apex.
      Leaves membranous, with a thin coating of white hairs on both surfaces in addition to longer brown ones . 4. *convexum.*
      Leaves rigidly chartaceous, with a dense coating of white hairs on both surfaces in addition to longer brown ones . . . . . 5. *Mairei.*

2046 1. **A. notochlaena,** Craib, comb. nov.

2042 *Didissandra notochlaena,* Lévl. et Van. in Compte Rend. Ass. Fr. (1905), 1906, p. 425.
Didymocarpus notochlaena, Lévl., l.c., p. 428.
Oreocharis notochlaena, Lévl., Fl. Kouy-Tcheou, p. 185.

Kouy-Tcheou, Tsin-gay, Tchao-se, Laborde et Bodinier, 2684 !

2047 2. **A. saxatile,** Craib, comb. nov.

2041 *Didissandra saxatilis,* Hemsl. in Journ. Linn. Soc., xxvi, 227 (1890).
Didymocarpus saxatilis, Lévl. in Compte Rend. Ass. Fr. (1905), 1906, p. 427.

Hupeh. Wilson, 1584 ! Patung, Kuei, and Fang, on vertical cliffs, Henry.

Szechuan. S. Wushan, Henry.

var. ? **microcalyx,** Hemsl., l.c.

Szechuan. S. Wushan, Henry.

3. **A. concavum,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 234 (1919).

Yunnan. Mekong-Yangtze divide, Kari Pass. Lat. 27° 40′ N. Alt. 11,000 ft. On trunks of trees and moss-covered boulders

in shady situations. Plant of 4–7 inches. Flowers deep orange. G. Forrest, 12,943 ! Fl. et Fr. Aug. 1914.

? Mekong-Salwin divide. Lat. 28° 10′ N. Alt. 10,000 ft. On trees and rocks in shady situations. Plant of 3–5 inches. G. Forrest, 13,445 ! Fr. Oct. 1914.

Yunnan. G. Forrest, 16,634 ! Fl. et Fr. July 1918.

4. **A. convexum,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 235 (1919).

Didymocarpus aurea, Diels in Notes Roy. Bot. Gard. Edin., vii, p. 271, *non* Roettlera aurea, *Franchet.*

Yunnan. Eastern flank of the Tali Range, 9000–10,000 ft. Lat. 25° 40′ N. On humus-covered boulders and trees. Plant of 4–8 inches. Flowers deep ruddy orange. G. Forrest, 7105 ! Fl. July 1910. 4803 ! Fl. June-July 1906. 15,483 ! Fl. et Fr. Aug. 1917. 15,930 ! Fl. Aug.-Sept. 1917.

Shweli-Salwin divide. Lat. 25° 30′ N. G. Forrest, 17,623 ! Fl. et Fr. July 1918.

5. **A. Mairei,** Craib, comb. nov.

Didymocarpus Mairei, Lévl. in Fedde Rep. Nov. Sp., xi, 301 (1912) ; id., Cat. Pl. Yunnan, p. 123.

Yunnan. Ma hong, 3000 m., E. E. Maire ! Fl. July.

Isometrum, Craib.

Filaments glabrous	1. *Farreri.*
Filaments with glandular hairs	2. *glandulosa.*

1. **I. Farreri,** Craib in Notes Roy. Bot. Gard. Edin., xi, p. 250 (1919).

Oreocharis Henryana, Farrer in Journ. Roy. Hort. Soc., xlii, 87 (1916), *non* Oliver.

S. Kansu. Very general at low elevations on rather cool rocks and very steep banks of cool clammy soil that grows a fine film of moss. Flowers a pretty shrimpy pink with a bronzy tone. Farrer et Purdom, 262 ! Fl. Aug. 28.

2. **I. glandulosa,** Craib, comb. nov.

Didissandra glandulosa, Batalin in Act. Hort. Petrop., xii, 175 (1892).

N. Szechuan. Potanin. Fl. 17th Aug. 1885.

I have seen no specimens of Batalin's Szechuan species, but

from the description it must be very closely allied to the Kansu plant. Batalin's original description does not, however, apply to Farrer's plant in a few details, and under these circumstances I have decided to keep the two plants separate.

From description alone I would incline to the inclusion in this genus of *Didissandra Fargesii*, Franchet, described from Szechuan plants. The description, however, suggests no points of difference between this plant and *Didissandra glandulosa*, Batalin, unless the slightly longer corolla of the latter.

Revision of Petrocosmea.

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THE genus *Petrocosmea* was originally described by Oliver * in 1887 from Dr. Henry's Ichang collections. Eight years later Hemsley † added another species—*P. grandiflora*—which was collected at Mengtze by Hancock. These two species—*P. sinensis* and *P. grandiflora*—agree in the lobing of the corolla limb. Although the limb is distinctly bilabiate, yet the five lobes are of subequal dimensions. In 1899 Hemsley ‡ added two more species—*P. iodioides*, collected at Mengtze by both Hancock and Dr. Henry; and *P. minor*, collected also at Mengtze by Hancock. In these two species the posticous lip is very much shorter than the anticous, and for their reception Hemsley created a new section which he called *Anisochilus*. In 1911 two species were added by Léveillé §—*P. Cavaleriei* and *P. Martinii*,—both from Kouy-Tcheou, and in 1915 the same author ‖ described *P. Mairei* from Maire's Yunnan plants. In 1918 the present writer ¶ described another Mengtze species—*P. Henryi*. At this time the genus was confined to Hupeh, Kouy-Tcheou, and Yunnan, but last year the genus was recorded ** from N. Siam, where Dr. Kerr collected *P. Kerrii*. Thus at the present time the genus consists of 9 species—8 Chinese and 1 Siamese. In this contribution six more species are added—all from China.

KEY TO THE SPECIES.

Lips of corolla of subequal length, the posticous not clasping the style . . . . . (§ **Eupetrocosmea**, Craib.)

Filament and connective hirsute . . . . 1. *P. grandiflora*.

Filament and connective glabrous.

* Oliver in Hook., Ic. Pl., xviii, t. 1716 (1887).
† Hemsley in Hook., Ic. Pl., xxv, t. 2410 (1895).
‡ Hemsley in Hook., Ic. Pl., xxvi, tt. 2599, 2600 (1899).
§ Lévl. in Fedde Rep. Nov. Sp., ix, p. 329 (1911).
‖ Lévl. in Bull. Acad. Geogr. Bot., 1915, p. 24.
¶ Craib in Notes Roy. Bot. Gard. Edin., x, p. 216 (1918).
** Craib in Kew Bull., 1918, p. 365.

Calyx segments nearly glabrous on back at flowering time, ciliate on margin . . . . . 2. *P. oblata.*
Calyx segments pilose on back at flowering time.
Midrib and lateral nerves conspicuous below, broad and rather densely covered with patent white hairs . 3. *P. nervosa.*
Midrib and lateral nerves not conspicuous or only occasionally subconspicuous below.
Leaves up to 4.5 cm. long . . . . 4. *P. flaccida.*
Leaves up to 3 cm. long . . . . 5. *P. sinensis.*
Anticous lip decidedly longer than posticous, the latter clasping the style . . . . . (§ **Anisochilus**, Hemsl.)
Filament glabrous.
Anthers almost 5 mm. long, exserted ; leaves mostly coarsely and regularly few-toothed, cuneate at base, up to 2 cm. long . . . . . 6. *P. Henryi.*
Anthers under 2 mm. long, included ; leaves entire, crenulate or shallowly toothed, membranous, up to 3 cm. long, cuneate to cordate at base.
Style shortly pubescent on the lower part . 7. *P. Forrestii.*
Style with very long silky hairs on the lower part.
Anthers about 0.6 mm. long, broader than long . . . . . 8. *P. Cavaleriei.*
Anthers 1–1.5 mm. long, longer than broad . 9. *P. barbata.*
Filaments not glabrous.
Leaves up to 10 cm. long . . . . . 10. *P. Kerrii.*
Leaves up to 3 cm. long.
Filaments about twice as long as anthers, which are under 1 mm. long.
Calyx segments about 3 mm. long, filaments straight . . . . . 11. *P. Mairei.*
Calyx segments about 4 mm. long, filaments curved towards apex . . . . . 12. *P. minor.*
Filaments slightly longer or shorter than anthers or about half as long as anthers, the anthers being at least 2.5 mm. long.
Anther twice as long as filament . . 13. *P. Duclouxii.*
Anther subequal to filament.
Leaves up to 2 cm. long, mostly elliptic to rounded-ovate ; calyx about 4 mm. long . . . 14. *P. Martinii.*
Leaves up to 3 cm. long, mostly ovate to elliptic-ovate ; calyx about 6 mm. long . . . 15. *P. iodioides.*

ENUMERATION OF THE SPECIES.

1. **P. grandiflora,** Hemsl. in Kew Bull., 1895, p. 115 ; id. in Hook., Ic. Pl., t. 2410.

Yunnan. Mengtze, crevices of limestone precipices, 6400 ft. Hancock, 115.

2052 2. **P. oblata,** Craib, sp. nov.

Herba nana, rhizomate brevi crasso. Folia oblata vel orbicularia, apice rotundata truncatave, basi truncata vel cordatula, usque ad 3 cm. diametro, ut videtur viva plus minusve carnosa,

pagina utraque pilis breviusculis subconspicuis conspersa, nervis lateralibus utrinque 3–4 obscuris vel subobscuris, margine ciliata, petiolo usque ad 4 cm. longo sparse piloso cito plus minusve glabrescente suffulta. Inflorescentia e floribus pluribus (usque ad 8) pedunculis 3.5–8.5 cm. longis medio brevi-bracteatis breviter albo-pilosulis saepe purpurascentibus singulatim gestis. Calyx dorso subglaber, sicco plus minusve purpurascens, in segmenta 5 lanceolata vel lineari-lanceolata apice breviter obtuse acuminata inter se subaequalia circa 3 mm. longa et 1 mm. lata trinervia vel 5-nervia et nervis marginalibus subconspicuis tantum nervis infra apicem summum concurrentibus partitus. Corollae tubus circa 2.5 mm. longus ; limbus bilabiatus ; labium posticum circa 6 mm. longum, bilobatum, lobis oblongis apice rotundatis vix 4 mm. longis 3 mm. latis ciliolatis, anticum 6–7 mm. longum, trilobatum, lobis oblongis vel elliptico-oblongis apice rotundatis ciliolatis mediano usque ad 6 mm. longo. Stamina fertilia duo, filamentis glabris 1.5 mm. longis, antheris 2.25 mm. longis apice emarginulatis, connectivo glabro. Ovarium 1.5 mm. altum, pilosum, stylo 6 mm. longo inferne incrassato et breviter piloso, stigmate parvo. Capsula straminea, 4–5 mm. longa.

S.W. Szechuan. Mu-li Mountains. Lat. 28° 12′ N. Alt. 10,000 ft. G. Forrest, 16,859/b ! Fl. Sept. 1918.

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3. **P. nervosa,** Craib, sp. nov.

Herba nana, rhizomate brevi crasso. Folia erecta vel suberecta, quoad formam variabilia, obovata, elliptico-obovata, oblato-obovata, oblata vel rotundata, apice rotundata vel subrotundata, basi cuneata, rotundato-truncata vel cordata, usque ad 5.5 cm. longa et lata, viva carnosula, sicco chartaceo-membranacea, pagina superiore pilis transverse septatis flaccidis sat dense vel fere sparse instructa, inferiore ad costam nervosque pilosa, aliter sparsius pilosa, nervis lateralibus utrinque 3 supra obscuris subtus latis conspicuis, margine integra vel interdum crenulata, petiolo 3–4 cm. vel rarius usque ad 8 cm. longo piloso suffulta. Pedunculi numerosi, paulo supra medium parvi-bracteati, uniflori, rarius 2–3-flori, circa 6 cm. longi, longius albo-pilosi. Calyx dorso breviter pilosus, in segmenta 5 inter se subaequalia lanceolata vel lineari-lanceolata apice obtusiuscula 3–4 mm. longa 0.75–1 mm. lata interdum paucidentata ciliata trinervia partitus. Corollae tubus 2.5 mm. longus, limbus bilabiatus ; labium posticum 7 mm. longum, paulo ultra medium bilobatum, lobis oblongis apice rotundatis ciliatis, anticum paululo ultra 6 mm. longum, trilobatum, lobis oblongis apice rotundatis circa 4.5 mm. longis ciliatis. Stamina fertilia duo, glabra, filamentis 1.5 mm. longis, antheris apice emarginulatis

2 mm. longis. Ovarium calyce parum brevius, pilosum, stylo 6 mm. longo inferne pilosulo, stigmate parvo capitato. Capsula circa 5 mm. longa.

Yunnan. Yung-peh Mountains. Lat. 26° 42′ N. Alt. 8000–9000 ft. Dry stony pasture. Plant of 2–4 inches. Flowers blue; foliage fleshy. G. Forrest, 16,891! Fl. Sept. 1918.

Yung-peh Mountains. Lat. 26° 42′ N. Alt. 9000 ft. Open dry situations on rocks and cliffs. Plant of 3–4 inches. G. Forrest, 16,653! Fr. July 1918.

2053

4. **P. flaccida,** Craib, sp. nov.

Herba nana, rhizomate brevi crasso. Folia oblata, rotundato-oblata vel fere rotundata, apice rotundata truncatave, basi cuneata vel acuminato-cuneata, usque ad 4.5 cm. longa et lata, viva carnosa, pagina utraque pilis sat longis albis transverse septatis flaccidis conspersa, nervis lateralibus utrinque 3–4 supra obscuris subtus subconspicuis, margine ciliata, integra vel rarius undulato-crenulata, petiolo usque ad 10 cm. sed saepissime 5–7 cm. longo piloso vel sparse piloso suffulta. Pedunculi numerosi, praesertim superne albo-pilosi, supra medium bracteis duabus parvis instructi, uniflori, saepissime 5–6 cm. alti. Calyx extra pilosus, in segmenta 5 lanceolata vel lineari-lanceolata apice obtusiuscula vel breviter obtuse acuminata inter se subaequalia 3–4 mm. longa 3–5-nervia ciliata partitus. Corollae tubus 2.5–3 mm. longus, limbus bilabiatus; labium posticum 6–7 mm. longum, ultra medium bilobatum lobis oblongis apice rotundatis ciliatis, anticum 7–7.5 mm. longum, fere ad basem trilobatum, lobis obovatis vel oblongo-obovatis apice rotundatis ciliatis. Stamina fertilia duo, glabra, filamentis 1.5 mm. longis, antheris 2.25 mm. longis apice emarginulatis. Ovarium calyce brevius, stylo 5 mm. longo inferne breviter piloso, stigmate parvo. Capsula 5–6 mm. longa.

S.W. Szechuan. Mu-li Mountains. Lat. 28° 12′ N. Alt. 10,000 ft. Open dry pasture and on cliffs. Plant of 2–3 inches. Flowers blue. G. Forrest, 16,859*a*! Fl. Sept. 1918.

5. **P. sinensis,** Oliver in Hook., Ic. Pl., xviii, t. 1716 (1887).

Hupeh. Ichang, Henry, 2321, 2921. Hupeh, Wilson, 2541!

6. **P. Henryi,** Craib in Notes Roy. Bot. Gard. Edin., x, p. 216 (1918).

P. minor, Hemsl. in Hook., Ic. Pl., xxvi, t. 2600 (1899), quoad pl. Henryanam.

Yunnan. Mengtze; cliffs in shade, 5000 ft. Single blue flowers. Henry, 9154!

7. **P. Forrestii,** Craib, sp. nov.

Folia in rosulam patulam primo densam 4–10 cm. diametro disposita, rarius suberecta, elliptica vel rhombeo-elliptica, rarius rotundata, apice obtusa vel rotundata, basi cuneata vel late cuneata, ad 3 cm. longa et 2.2 cm. lata, membranacea vel chartaceo-membranacea, supra iuventute sericea, mox pilosa, pilis sat longis transverse septatis, subtus pilis similibus sed parum brevioribus pilosa, nervis lateralibus utrinque circa 3 obscuris, margine ciliata, integra vel rarius pauci-crenata, petiolo sparse piloso ad 3 cm. longo suffulta. Pedunculi numerosi, breviter pilosi, supra medium bracteis duabus parvis instructi, uniflori. Calyx extra pilis albis brevibus plus minusve adpressis sat dense tectus, in segmenta 5 lineari-lanceolata apice acutiuscula inter se subaequalia vix ad 4 mm. longa basi 1 mm. lata longius ciliata nervis obscuris partitus. Corolla intus postice dense pilosa, antice sparse pilosa, tubo 4 mm. longo, limbo conspicue bilabiato; labium posticum circa 3.5 mm. longum, bene ultra medium bilobatum, lobis apice rotundatis ciliolatis, anticum 7 mm. longum, ad medium trilobatum, lobis late oblongis apice rotundatis ciliolatis. Stamina fertilia duo, glabra, filamentis 2 mm. longis ad medium flexis, antheris 1.75 mm. longis apice rotundatis vel leviter emarginatis. Ovarium villosum, in calyce bene inclusum, stylo 5.5 mm. longo inferne sparse pubescente, stigmate parvo. Capsula circa 4 mm. longa.

Yunnan. Western flank of the Tali Range. Lat. 25° 40′ N. Alt. 7000 ft. On shady rocks. Plant of 2–4 inches. Flowers light blue. G. Forrest, 15,561! Fl. July 1917.

8. **P. Cavaleriei,** Lévl. in Fedde Rep. Nov. Sp., ix, p. 329 (1911), pro parte; id. Fl. Kouy-Tcheou, p. 185, pro parte.

Kouy-Tcheou. Gan-pin. Martin et Bodinier, 1907! Fl. Oct. 1897 (type).

As the type of Léveillé's species I have taken the first specimen quoted in the original description. If we take the character of the pilosity of the lower part of the style where the hairs are very long, white, and spread at right angles to the style, then Cavalerie, 1898, from Tien-sen-kiao would also belong to *P. Cavaleriei.* Cavalerie, 837, however, from Long-ly does not show this character, and again the filaments are not glabrous. This collection I should refer to *P. Martinii.*

9. **P. barbata,** Craib, sp. nov.

Herba nana. Folia omnia basalia, suberecta, plus minusve rotundata vel ovata, rarissime ovato-lanceolata, apice rotundata obtusave, basi late cuneata, rotundata, cordatave, ad 2.5 cm.

longa et lata, membranacea, supra viridia, sublaxe flaccide pilosa, subtus pallidiora, ad costam nervosque laterales densius pilosa, aliter pilosa, nervis lateralibus utrinque 3–4 supra obscuris subtus saepe subconspicuis, margine crenata, ciliata, petiolo ad 6 cm. longo laxe piloso suffulta. Pedunculi ad 10 cm. longi, laxe pilosi, bene supra medium parvibracteati, uni- vel bi-flori. Calyx extra pilosus, in segmenta 5 inter se subaequalia, lanceolata vel lineari-lanceolata, circa 3 mm. longa et basi 1 mm. lata, ciliata, 3-nervia partitus. Corolla distincte bilabiata, postice 4 mm. longa, intra densius pilosa, antice 8.5 mm. longa, intra sparse pilosa, tubo 2.75 mm. longo ; labium posticum ad medium bilobatum, lobis rotundatis ciliatis, anticum paulo ultra medium 3-lobatum, lobis ellipticis vel elliptico-obovatis apice rotundatis ciliatis. Stamina fertilia duo, glabra, filamentis basi curvatis 1.5 mm. longis, antheris 1–1.5 mm. longis. Ovarium breve, in calyce bene inclusum, stylo 4 mm. longo inferne longe barbato, stigmate parvo. Capsula circa 6 mm. longa.

Yunnan. Yunnan-sen, Maire, 2329 !

10. **P. Kerrii,** Craib in Kew Bull., 1918, p. 365.

Siam. Doi Sutep, damp rocks in evergreen jungle, 1560 m., Kerr, 3361 ! Fl. Sept. 1914.

11. **P. Mairei,** Lévl. in Bull. Acad. Geogr. Bot., xii, p. 166 (1903).

Yunnan. Rochers des mont. à Tcha-ho, 2600 m., Fl. bleues. Maire, 89 ! et sine num. ! Fl. Aug.

12. **P. minor,** Hemsl. in Hook., Ic. Pl., xxvi, t. 2600 (1899), pl. Henryana exclusa.

Yunnan. Mengtze, on rocks, 6000–7000 ft. Hancock, 428 (Herb. Kew !).

2601 13. **P. Duclouxii,** Craib, sp. nov.

Herba nana, rhizomate brevi. Folia omnia basalia, suberecta, plus minusve rotundata vel ovato-rotundata, apice rotundata, basi saepissime cordata, saepissime 1–2 cm. longa et lata, chartacea, supra pilosa, subtus dense pilosa, nervis lateralibus utrinque 3–5 supra obscuris subtus interdum conspicuis, margine integra vel saepissime crenulata, petiolo sparse piloso usque ad 7.5 cm. longo suffulta. Pedunculi numerosi, uniflori, saepe purpurascentes, sparse albo-pilosi, usque ad 10 cm. alti. Calyx dorso breviter pilosus, in segmenta 5 lanceolata vel lineari-lanceolata apice acutiuscula circa 3 mm. longa basi vix 1 mm. lata trinervia ciliata partitus. Corolla distincte bilabiata, postice 7.5 mm. longa, antice 13–15 mm. longa, tubo circa 4 mm.

longo ; labium posticum fere ad basem bilobatum, anticum vix ad medium trilobatum, lobis apice rotundatis ciliolatis. Filamenta recta, pilis capitatis brevibus densius furfuracea, vix 2 mm. longa, antheris 3 mm. longis. Ovarium calyce paulo brevius ; stylus 6 mm. longus, superne glaber, inferne sparse pubescens, stigmate parvo. Capsula circa 6 mm. longa.

Yunnan. Yunnan-sen—fissures des roches—montagne—fl. bleues. F. Ducloux, 548/906 ! Fl. June 1908 (type). Yunnan-sen, Maire, 230 ! 615 (Fl. May) ! 2/671 (Fl. June) ! 1349 !

14. **P. Martinii,** Lévl. in Fedde Rep. Nov. Sp., ix, p. 329 (1911).

P. Cavaleriei, Lévl., l.c., p. 329, pro parte.

Vaniotia Martinii, Lévl. in Bull. Acad. Geogr. Bot., xii, p. 166 (1903).

Kouy-Tcheou. Gan-pin, Martin et Bodinier, 2683 ! Fl. June 1899. Long-ly, Cavalerie, 837 !

15. **P. iodioides,** Hemsl. in Hook., Ic. Pl., xxvi, t. 2599 (1899).

Yunnan. Mengtze, N. mts., on cliffs in shade, 7000 ft. Henry, 10,259 !

Note on the Occurrence of a new Coccid in the Royal Botanic Garden, Edinburgh.

BY

E. ERNEST GREEN, F.Z.S.

An interesting Coccid, at present undescribed, has been found at the Royal Botanic Garden, Edinburgh, where it occurs—in some abundance—upon *Gaultheria depressa*, Hook. f., growing in one of the cool houses. The insect proves to be a species of *Poliaspis*—a genus characterised by the possession of supplementary circumgenital glands. It is allied to, but sufficiently distinct from, *Poliaspis cycadis*—a species that has been found attacking Cycads in one of the tropical houses at the Royal Gardens, Kew. The infested plants of *Gaultheria* were raised from seed received from New Zealand; so there can be no question of the introduction of this Coccid with its host plant; though, curiously, one of its nearest allies (*Poliaspis argentosa*) is a native of New Zealand. The new species (for which the name of *gaultheriae* is proposed) will be described and figured in an early number of the Entomologist's Monthly Magazine.

[Notes, R.B.G., Edin., No. LV, November 1919.]

ABIES FORRESTII, CRAIB.

ABIES DELAVAYI, FRANCHET.

ABIES FABERI, CRAIB.

Abies Delavayi in Cultivation.

BY

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With Plates CLXII-CLXIV.

From recent correspondence addressed to the Royal Botanic Garden it became evident that doubts existed as to what the true *Abies Delavayi* is, as to whether the true plant is in cultivation, and if not, as to the identification of plants recently introduced under that name. The plants at present under cultivation come from two districts in China, viz. Western Szechuan, where seeds were collected by E. H. Wilson; and Western Yunnan, where G. Forrest collected seeds. For some time now it has been recognised that the pioneers were mistaken in their ideas that the Himalayan and S.W. Chinese floras were practically identical. Wherever possible plants of the earlier collections were referred to Himalayan species. But more recent critical work has shown us that in the S.W. corner of China we must recognise certain definite floristic areas. Two such regions which must be regarded as distinct are W. Szechuan, the exploration of which has been so well carried out by E. H. Wilson, and that portion of Yunnan which concerns us at present where Delavay obtained the material elaborated by Franchet and from which no small part of the rich collections of G. Forrest has been obtained. Occasion therefore arises for a careful examination of the material when one finds Wilsonian plants enumerated as identical with Delavayan. Examination of Wilson's material of his so-called *Abies Delavayi* has afforded additional proof of the distinctness of the two regions referred to. Wilson's Szechuan plant is, in my opinion, certainly not identical with Franchet's Yunnan *A. Delavayi*. For the Szechuan material seen by me I propose the new combination *A. Faberi*, since the plant had already been described as *Keteleeria Fabri* by Masters.

Further confusion arose owing to the fact that a Forrestian plant has been distributed and is growing here as in other places

under the name *A. Delavayi*. Now *A. Delavayi* was based on a Tali plant collected by Delavay, and, as noted below, Forrest's Tali plant is identical with *A. Delavayi*. But the Forrestian plant in cultivation was raised not from Tali but from Lichiang seed, and the Lichiang plant proves quite distinct from the Tali one. For this Lichiang plant I propose the name *A. Forrestii*.

The following is a limited account of the synonymy and distribution of the species concerned, with diagnosis of the new species. I have limited the synonymy because from what has been said above it will be readily understood that, so far as our present knowledge goes, any reference to *A. Delavayi* based on a Szechuan plant is probably to *A. Faberi*, but certainly not to the true *A. Delavayi*.

SYNONYMY AND DISTRIBUTION WITH DESCRIPTION OF NEW SPECIES.

A. Delavayi, Franchet in Journ. de Bot., xiii, p. 255 (1899); auct. alii tantum quoad pl. Delavayanam et Forrestianam.

Yunnan. Tsang-chan, supra Tali, 3500–4000 m., R. P. Delavay, 1210. Open situations at the base of cliffs in side valleys on the eastern flank of the Tali Range, 8000–10,000 ft. Lat. 25° 40′ N. Shrub or tree of 10–40 ft. G. Forrest, 4606!

1027 **A. Faberi,** Craib, comb. nov.

A. Delavayi, Masters in Journ. Linn. Soc., xxxvii, 422 (1906); Patschke in Engler, Bot. Jahrb., xlviii, 642 et seq (1913), pro parte; Rehder et Wilson in Pl. Wils., pt. iv, p. 41 (1914), saltem pro parte, *vix* Franchet.

Keteleeria Fabri, Masters in Journ. Linn. Soc., xxvi, 555 (1902); id. in Gard. Chron., xxxiii, 194 (1903); Mottet in Rev. Hort., 1904, pp. 130–1; Masters in Journ. Linn. Soc., xxxvii, 421 (1906); Patschke in Engler, Bot. Jahrb., xlviii, 649 (1913).

Pinus Fabri, Voss in Putlitz et Meyer Landlexikon, iv, 773 (1913)—ex Rehder et Wilson, l.c.

Western Szechuan. Mount Omei, Faber, 984 (Herb. Kew!); Wa-shan, 3000–3600 m., Wilson, 2089, July 1908 (Herb. Edin.!).

I am indebted to the Director of the Royal Gardens, Kew, for the opportunity of examining Masters' type plant of *Keteleeria Fabri*.

The Szechuan and Yunnan plants, though unquestionably very closely allied, are, I believe, specifically quite distinct. My conclusions are based on a Tali plant collected by G. Forrest, and this plant conforms exactly to Franchet's original descrip-

tion of *A. Delavayi* which was drawn up from Delavay's Tali plant.

One of the main points noted by Franchet is that the transverse section of the leaf approximates in outline the symbol ∞. Forrest's plant fits exactly in this respect. The margins are so completely recurved that they practically touch the very prominent midrib, and throughout its length the lower surface is completely concealed. Further, this condition is maintained absolutely in Forrest's plant up to and including the oldest leaves, which in the herbarium specimens are 4 years old. Now in Faber's and Wilson's plant strong recurving of the margins are present, but the lower surface is not completely concealed throughout its length, and, moreover, here as the leaves become older the recurving becomes less pronounced, so that the lower surface becomes completely or almost completely uncovered.

Again, in Forrest's plant the lateral leaves tend to curve outwards in the lower part, but from about the middle or from just below the middle they curve inwards, whereas in Wilson's plant when the leaves are curved the curvature is uniformly backwards. The incurving of the leaves is mentioned by Franchet in his original description of *A. Delavayi*.

Transverse sections of the leaf of the two species, while showing no absolute differentiating mark, yet afford useful comparative differences which from the available material appear to be constant. Both species show a well-developed hypodermis, but that of *A. Delavayi* as also the epidermis consists of conspicuously thick-walled cells. Below the divided fibro-vascular bundle we find in *A. Delavayi* a few sclerotic cells, whereas in *A. Faberi* sclerenchyma is not prominently developed and is not constant. In *A. Faberi* the leaf margin is more or less conspicuously acuminate; in *A. Delavayi* the leaf margin is not acuminate or very shortly and very bluntly so. In *A. Delavayi* the large resin canals are more prominent, and the cells of the lower epidermis are more papillose on the midrib and towards the leaf margins than in *A. Faberi*.

Abies Forrestii, Craib, sp. nov.

Arbor 30–60-pedalis; ramuli vivi iuventute primo transverse corrugatuli, dein plus minusve papillosi, brunnei, glabri vel magis minusve pilulosi, mox parum pallidiores, longitudinaliter et saepe transverse fissi; cicatrices circulares; alabastra terminalia obovoidea, pallida, valde resinosa; perulae ad annos 5 saltem persistentes, ramulorum bases cingentes. Folia spiraliter inserta, pectinatim disposita, adscendentia, in plantis vivis paginam inferiorem bene exhibentia, saepissime parum longitudinaliter arcuatim retroflexa, inferiora superioribus longiora,

ad 4 cm. longa et 2.5 mm. lata, supra nitido-viridia, subtus fasciebus duobus stomatiferis utroque e lineis circa 12 constituto albis praedita, apice rotundata, emarginata, nervo mediano supra impresso subtus valde prominente. Amenta mascula apicem versus ramulorum aggregata, sessilia, 12–15 mm. longa, folia subaequantia.

Cult. Hort. Bot. Reg. Edin., G. Forrest, 6744 !

Yunnan. Eastern flank of the Lichiang Range. Lat. 27° 25′ N. 10,000–11,000 ft. Tree of 30–60 ft., forming forests. G. Forrest, 6744 (Herb. Edin. !).

This species, whose introduction to cultivation we owe to Mr. G. Forrest, is one of the prettiest foliaged plants of the genus. The very white undersurface of the leaves is conspicuous at some distance from the plant owing to the course of the leaves, those inserted on the lower side of the branchlet being directed forwards and upwards at the base and curving slightly backwards from about the middle, those on the upper side are twisted at the apex of the petiole to the sides, and also curve slightly backwards. The V-shaped groove is conspicuous but narrow. The terminal buds, as also the lateral, are short, rounded at the apex, pale pinkish-white, and heavily resin-coated. Branchlets in the first year are brown, glabrous, or with scattered erect short stiff hairs ; in the second year they are dark-brown.

Transverse sections of the leaf show a well-developed continuous hypodermis on the upper surface and on the lower side at the prominent midrib a 2- or in part 3-seriate hypodermis, 2 lateral, sub-epidermal, medium-sized resin canals, a definite endodermis enclosing a divided fibro-vascular bundle, a group of sclerotic cells on the lower side of the bundle, and usually 1–3 such cells above. The leaf-margins are slightly recurved.

Conclusions I. *Abies Delavayi*, Franchet, is not in cultivation.

II. The plant introduced as *A. Delavayi* from Szechuan should be known as *A. Faberi* (Masters), Craib.

III. The Yunnan plant introduced by Mr. G. Forrest has been described as a new species—*A. Forrestii*, Craib.

LIST OF PLATES,

Illustrating Mr. Craib's Paper on Abies Delavayi.

PLATE CLXII. Photograph of *A. Forrestii* growing in the Royal Botanic Garden, Edinburgh.

CLXIII. Photograph of herbarium specimen of *A. Delavayi*, Franchet.

CLXIV. Photograph of herbarium specimen of *A. Faberi* (Masters), Craib.